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A Revision of *Bootania* Dalla Torre and Recognition of *Macrodasyceras* Kamijo (Hymenoptera: Torymidae)

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Abstract.—The genus *Bootania* Dalla Torre is revised and the genus *Macrodasyceras* Kamijo is removed from synonymy with it and returned to generic rank (revised status). Species included in *Bootania* are: *gigantea* (Girault), *leucospoides* (Walker), *maxima* (Strand), *neocaledonica* (Milliron), *pilicornis* (Cameron), *ruficeps* (Cameron), *solomonensis* (Milliron), and *titanus* (Girault). Species removed from *Bootania* to the genus *Macrodasyceras* are *hirsutum* Kamijo and *japonicus* (Ashmead) (both revised combinations). In this paper, redescriptions are given for the 8 known species of *Bootania*, and 4 new species are described: ***orba* Desjardins and Grissell, *moorea* Desjardins and Grissell, *fascia* Grissell and Desjardins,** and ***xestos* Grissell and Desjardins.** A lectotype is designated for *B. gigantea*. The holotype of *B. neocaledonica* is reported missing. An illustrated key is given for all species. Seven of the 12 known species have been reared from seeds of *Pandanus* and 1 was collected on *Pandanus*. Although hosts are unknown for the other 4 species it is likely that they are associated with the same host plant. Species of *Bootania* are Australasian, ranging from Bhutan, Burma, and Sri Lanka in the northwest, eastward to Republic of China and southward through Borneo/Sarawak, the Solomons, Papua New Guinea, New Caledonia, Fiji, Moorea, and northeastern Australia.

Species of *Bootania* Dalla Torre are giants among the Chalcidoidea, ranging up to 4.5 cm in length including the greatly exserted ovipositor (Fig. A). Since its recognition in 1862 (as *Metamorpha* Walker), eight species of *Bootania* have been described, four of which are phytophagous in seeds of *Pandanus* S. Parkinson (Pandanaceae) and four of which have no known host. Currently recognized species include: *gigantea* (Girault), *leucospoides* (Walker), *maxima* (Strand), *neocaledonica* (Milliron), *pilicornis* (Cameron), *ruficeps* (Cameron), *solomonensis* (Milliron), and *titanus* (Girault) (Grissell 1999). These species are Australasian in distribution, ranging from Bhutan, Burma, and Sri Lanka in the northwest, eastward to Republic of China and southward through Borneo/Sarawak, the Solomons, Papua New Guinea, New Caledonia, Fiji, Moorea, and northeastern Australia.

In this paper we redescribe all valid species of *Bootania*, describe 4 new ones (3 reared from *Pandanus*), provide an illustrated key for their identification, and summarize all known host and distribution data. Two additional species transferred to *Bootania* by Bouček (1988) are reinstated to their original genus, *Macrodasyceras* Kamijo, as explained below.

Seven of the 12 known species of *Bootania* have been reared from *Pandanus*, and it is likely that these wasps are restricted to seeds of this host plant. *Pandanus* has well over 700 described species that are widespread from "Africa to Asia and various archipelagos in the Pacific" (Stone et al. 1998). Several species of *Pandanus*, including the Tahitian screwpine (*Pandanus*

Fig. A. *Bootania maxima*, female, habitus.

tectorius Parkinson ex Zucc.), have been introduced into Hawaii and Puerto Rico (USDA, NRCS 1999), and evidence suggests that *Bootania orba* (see below) has been transported as well (specimens from "Malaysia" found at a San Francisco port of entry in 1970). Whether or not any *Bootania* species have been transported and established in other areas is unknown, but it is likely that *Pandanus* has been moved around various Pacific islands for centuries. They are of great economic importance to inhabitants of the region, providing edible leaves, fruits, seeds, spices, and fiber for baskets, roofing materials, and various domestic articles (California Rare Fruit Growers 1989, Stone et al. 1998).

Because there are so many species of *Pandanus*, because they are so widespread, and because each of the 12 known *Bootania* species comes from a widely divergent geographic area within the Australasian realm, it is likely that many species of *Bootania* remain to be discovered. This paper serves as a preliminary step in understanding the morphology, taxonomy, and host range of this group of wasps. No biological details are known for these large, widespread seed-feeders, except for individual host records.

The following abbreviations are used for institutions cited in the text: ANIC—Australian National Insect Collection, Canberra; BMNH—The Museum of Natural History, London; QM—Queensland Museum, Brisbane; UQ—University of Queensland, Brisbane; USNM—National Museum of Natural History, Washington, DC; ZMB—Zoologisches Museum, Berlin. We use the abbreviations F1, F2, etc. for funicle segment 1, 2, etc. In the descriptions, "body" refers to the mesosoma + metasoma and excludes the head.

Bootania Dalla Torre

Metamorpha Walker 1862:346. Type species: *Metamorpha leucospoides* Walker (monotypic).

Bootania Dalla Torre 1897:86. Replacement name for *Metamorpha* Walker preoccupied by *Metamorpha* Hübner 1819:43 (Lepidoptera: Nymphalidae).

Spilomegastigmus Cameron 1905:73–74. Type species: *Spilomegastigmus ruficeps* Cameron (monotypic).

Eutanycormus Cameron 1909:209–210. Type species: *Eutanycormus pilicornis* Cameron (monotypic).

Pulvilligera Strand 1911:59. Type species: *Pulvilligera maxima* Strand (original designation).

Of the above generic names, Dalla Torre (1897) provided a replacement name for *Metamorpha* of Hübner (1819), Bouček (1988:127) synonymized *Spilomegastigmus* and *Eutanycormus*, and Riek (in Kamijo 1962:36) synonymized *Pulvilligera*. We have studied the type species of each of these generic names, and agree with their synonymy.

Bouček (1988) synonymized *Macrodasyceras* Kamijo (1962) [type species: *Megastigmus japonicus* Ashmead, USNM, examined] with *Bootania*, but the reasons for doing so were not clear, and in any case we do not agree with this placement. In proposing the synonymy, Bouček first stated that "Kamijo [1962] used the length of the postmarginal vein (longer than marginal) for separation of *Macrodasyceras* from *Megastigmus* (at most as long as marginal)." This is actually the reverse of what Kamijo said for *Macrodasyceras* ("Marginal vein distinctly longer than postmarginal") and *Megastigmus* ("Marginal vein as long as or shorter than postmarginal"). Additionally Bouček stated that ". . . in Australian species of *Megastigmus* the postmarginal vein is also much longer than the marginal," thus agreeing in principal with Kamijo's characterization of *Megastigmus*. Bouček's argument, in fact, gives no reason to synonymize *Macrodasyceras* with *Bootania*, but rather to separate *Macrodasyceras* from *Megastigmus*.

Bouček (1988) also stated that *Macrodasyceras* and *Megastigmus* ". . . differ greatly in the male antennae." It is possible that the name *Megastigmus* was a mistake for *Bootania*, and that the point Bouček (1988) was making was that males of *Bootania* + *Macrodasyceras* both have whorled setae on funicle segments 1–7, and thus the latter should be synonymized with the former. Bouček (1988) gave no other reasons for the synonymy.

The recognition of *Macrodasyceras*, *Megastigmus*, and *Bootania* poses a difficult question of generic limits. Kamijo (1962), in his key to Japanese genera of Megastigminae, differentiated his new genus *Macrodasyceras* from *Megastigmus* with the following diagnostic characters: "marginal vein distinctly longer than postmarginal," "antennae inserted much above middle of face," with "scape extending beyond level of medial ocellus," "gaster of female with petiole more or less distinct," "first to fourth tergites deeply incised at apex," and funicle of male with "sparse, outstanding hairs which are as long as the funicle segment." We have compared these characters and others for *Macrodasyceras*, *Megastigmus*, and *Bootania*, and conclude that two of the synapomorphies given by Kamijo supports recognition of *Macrodasyceras*: the relatively short postmarginal vein (shorter than marginal), and the petiolate metasoma. These characters are not yet known in *Megastigmus* or *Bootania*. Additionally, *Macrodasyceras* are tiny wasps (less than 0.5 cm) reared from seeds of *Ilex* (Aquifoliaceae), whereas *Bootania* are huge wasps by comparison (2 cm and over) reared from seeds of *Pandanus*. Because of the morphological and biological differences, we remove *Macrodasyceras* from synonymy with *Bootania*, and return it to its original generic position (*revised status*). The only included species are *hirsutum* Kamijo and *japonicus* (Ashmead) (revised combinations), both of which are known from Japan (Ashmead 1904, Kamijo 1962, 1981 [key]).

The recognition of *Bootania* is actually more difficult to justify than that of *Macrodasyceras*. At first glance, species of *Bootania* appear distinct based (in part) upon their gigantic size, their exceptionally long postmarginal vein, the well-developed, heavily pigmented basal vein (Figs. 45, 46), and the male antenna with elongate funiculars from which arise erect or semierect setae longer than the width of the funicle (Fig. 38♂). Unfortunately all but the last of these morphological characters may also be found in *Megastigmus*, especially large species such as *M. albifrons* (Walker).

In Bouček's (1988) key to Australian genera of Torymidae, he used the following diagnostic characters to separate *Bootania* from *Megastigmus*: scape "slightly to considerably exceeding the vertex level," pronotum of female "dorsally long and flat," and male funicle "with long hairs arranged more or less in 2 whorls on each segment." Because of integradation, the

use of the scape either in relation to its placement on the face, its length relative to the eye, or its length relative to the vertex has proven of no diagnostic value when comparing *Bootania* to *Megastigmus*. The longer-than-wide, parallel-sided pronotum appears to be diagnostic for *Bootania* (in *Megastigmus* it is generally wider than long, but in some species it is longer than wide), but we have not examined all known *Megastigmus* to confirm this. We have found in *Bootania* that the metabasitarsis is exceptionally long (generally equaling tarsomeres 2–5 combined), and this may be diagnostic as well, though, again, this character needs to be compared to all 126 known species of *Megastigmus*. The male antenna is currently the only synapomorphy that clearly defines *Bootania*. Additionally, the unique plant host family (Pandanaceae) implies some degree of isolation from other species of *Megastigmus* (Grissell 1999). It is possible that *Bootania* will be found at most to be a species group of *Megastigmus*, but we retain the generic name until such time as the entire subfamily can be revised.

KEY TO SPECIES OF *BOOTANIA* DALLA TORRE

[This key is based largely on characters found in the females; males are unknown for 5 species as indicated below. The female of *pilicornis*, however, is essentially unknown so emphasis must be placed on the male of that species in comparison to others. In all species, dimorphism is expressed in males by the forewing being relatively more setose than in females and generally having the stigma wider and shorter (cf. Figs. 13, 15–17♀♂).]

1. Spiracle (Fig. 31) unique, set deeply within chamber encircled by lamelliform translucent rim (outwardly, rim appears to be enlarged spiracle); scrobal depression (Fig. 25) wider than parascrobal area; body mostly black, with few markings, dorsoventrally compressed, and almost entirely smooth (♂ unknown) ..... 12. ***xestos* Grissell and Desjardins, new species**
   Spiracle (Fig. 33) normal, set at surface of propodeum; scrobal depression (Figs. 23, 24, 26, 27) narrower than parascrobal area; body entirely yellow to orange brown, if approaching dark brown to black then body patterned (Figs. 4, 5, 6), laterally compressed, and at least scutum transversely carinate 2
2. Propodeum (Fig. 32) with subcircular median area defined by semicircular submedian carinae curving to nucha; encircled area acarinate, either polished or reticulate 3
   Propodeum (Figs. 33–37) without sub-circular median area, submedian carinae either absent, not reaching nucha (Fig. 34) or projecting straight to nucha (Fig. 37); medially irregularly carinate (except *moorea*, Fig. 34) 4
3. Nucha a distinct, parallel sided band (as in Fig. 36); propodeum medially reticulate; basal cell asetose (Fig. 45); stigma evenly surrounded by narrow brown stain, cubital and medial setal lines stained brown (Fig. 45) (♂ unknown) ..... 11. ***titanus* Girault**
   Nucha indistinct (Fig. 32); propodeum medially smooth; basal cell setose medially (Fig. 46); stigma with posteriorly elongated stain (Figs. 22, 46), remainder of wing hyaline (♂ unknown) ..... 9. ***ruficeps* Walker**
4. Interantennal area a raised lamelliform carina ending less than halfway to mid ocellus (Fig. 27) 5
   Interantennal area a raised lamelliform carina reaching almost to mid ocellus (Fig. 26), though it may be less developed in mid- to upper half (Fig. 28) 8
5. Tarsal claws bifurcate (Fig. 44); ventral margin of stigma concave (Fig. 14); female: stigmal vein shorter than stigmal width (Fig. 14♀) ..... 3. ***leucospoides* Walker**
   Tarsal claws simple (Fig. 43); ventral margin of stigma convex (Figs. 15–21); female: stigmal vein as long as or longer than stigmal width (Figs. 15–17, 19–22♀) 6
6. Head in dorsal view (Fig. 23) with facial setae longer than greatest midocellus diameter and reaching (or nearly) inner eye margin (i.e., upper face without wide, bare area be-

tween setae and inner eye margin); stigmal area entirely setose (Fig. 15♀) ..... 10. ***solomonensis*** **Milliron**

Head in dorsal view (Fig. 24) with facial setae shorter than greatest midocellus diameter and obviously not reaching inner eye margin (i.e., upper face with wide, bare area between setae and inner eye margin); stigmal area partially (Fig. 20) to completely (Fig. 17) bare 7

7. Median carina of propodeum (Fig. 37) bifurcating to form submedian carinae that reach straight to nucha; no transverse carinae medially; stigmal bare in anterior half (Fig. 20) (♂ unknown) ..... 5. ***moorea*** **Desjardins and Grissell, new species**

Median carina of propodeum (Fig. 34) bifurcating and diverging widely toward postspiracular sulcus, not reaching nucha; several transverse median carinae present; stigmal area completely bare (Fig. 17) ..... 6. ***neocaledonica*** **Milliron**

8. Head (Fig. 28) with carinae extending from lower face at most to toruli; scrobal depression without lateral carinae (Fig. 28) ..... 2. ***gigantea*** **(Girault)**

Head (Fig. 26) with carinae extending from lower face nearly to venter of lateral ocelli; scrobal depression with well-developed lateral carinae that extend to midocellus (Figs. 26, 29, 36) 9

9. Parapsidal line present (Fig. 9, 10); pronotum with transverse carinae nearly as well-developed as on mid lobe of scutum (Fig. 3); nucha a broad, distinct band anteriorly well defined (Figs. 35) 10

Parapsidal line absent; pronotum with transverse carinae obscure, less well-developed than on mid lobe of scutum; nucha poorly defined, essentially absent (Fig. 33) 11

10. Propodeum with median carina (Fig. 36); dorsum of head posteriorly with continuous dark band (Fig. 1); uncus at least 3× as long as wide (Fig. 19♀) (♂ unknown) ..... 1. ***fascia*** **Grissell and Desjardins, new species**

Propodeum without median carina (Fig. 35); dorsum of head posteriorly with 3 distinct dark spots (Fig. 2); uncus about as long as wide (Fig. 16) ..... 4. ***maxima*** **Strand**

11. Female and male: frenal line distinct, scutellum anteriorly with effaced longitudinal carinae, apical lamella distinctly pitted (Fig. 11); pronotum evenly faintly transversely carinate; male stigma about as wide as high, surrounded by brown stain (Fig. 13♂) ..... 7. ***orba*** **Desjardins and Grissell, new species**

Male (female states unknown, presumed same as male): frenal line absent, scutellum entirely polished, apical lamella faintly pitted (Fig. 12); pronotum smooth with few faint apical carinae; stigma as high as wide with no surrounding brown stain (Fig. 18♂) ..... 8. ***pilicornis*** **Walker**

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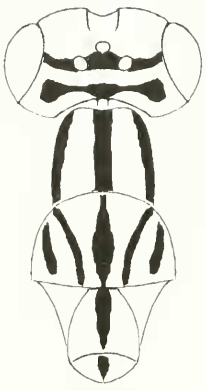
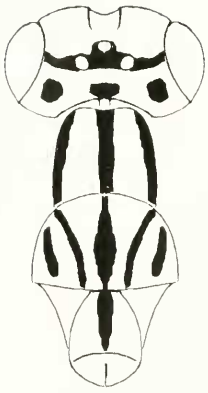
1. *Bootania fascia* Grissell and Desjardins, new species

Figs. 1, 10, 19, 29, 36

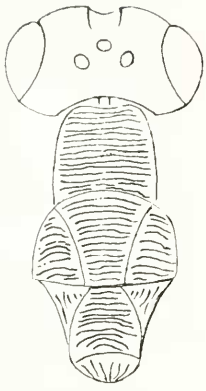
Female holotype.—Body length (excluding ovipositor) 11 mm; ovipositor length about 25 mm. *Color*: Yellowish orange with brown markings as follows (Fig. 1): narrow median stripe from clypeus to interantennal area; transverse band through ocelli to eye, transverse band across dorsum of head posterior to lateral ocelli, medially reaching occipital carina; pronotum with median and lateral longitudinal stripes; midlobe of mesoscutum with median longitudinal stripe; lateral lobe of mesoscutum with median longitudinal stripe; notaulus; scutellum with median longitudinal stripe extending from apical margin to frenal line and narrowly to posterior of frenal area; lateral panel of axilla posteriorly; femoral depression and transepimeral sulcus; propodeum medially except for submedian yellow spots; base of metasomal tergum 2 medially and laterally, 3–5 mostly brown with yellow center (other terga not visible). *Head*: Wider than high (8:7); in dorsal view with facial setae longer than greatest midocellus diameter



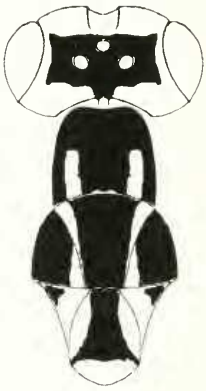
1. *fascia* ♀



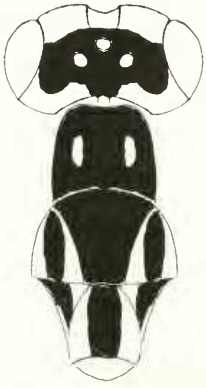
2. *maxima* ♀



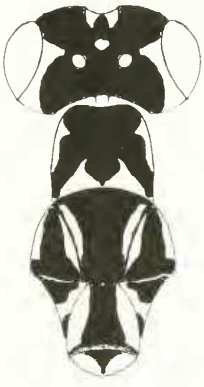
3. *maxima* ♀



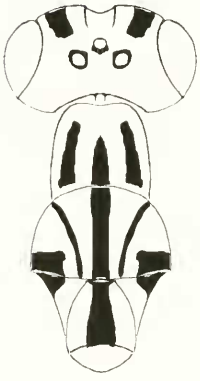
4. *pilicornis* ♂



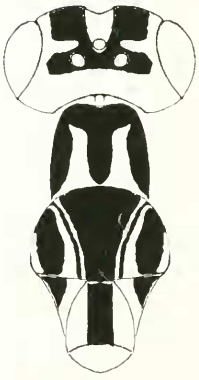
5. *titanus* ♀



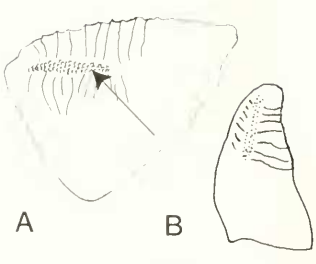
6. *leucospidoides* ♀



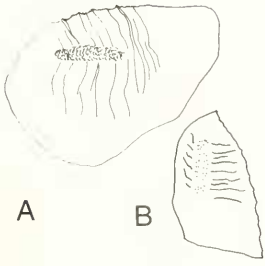
7. *orba* ♀



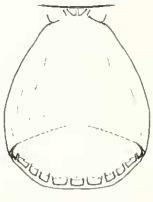
8. *orba* ♂



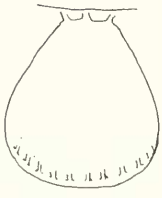
9. *maxima*



10. *fascia*



11. *orba*



12. *pilicornis*

Figs. 1–12. *Bootania* spp. 1–8, Color pattern, except 3, sculpture pattern (all dorsal view, diagrammatic). 9–10, Lateral lobe of scutum, A = lateral view (arrow points to parapsidal line), B = dorsal view. 11–12, Scutellum (dorsal view).

and reaching (or nearly) inner eye margin (i.e., upper face without wide, bare area between setae and inner eye margin) (as in Fig. 23); upper face bulging slightly; face with carinae extending from lower margin (excluding clypeus) to venter of lateral ocelli; genal and postgenal areas smooth, scrobal depression faintly striate except obviously carinate below median ocellus; scrobal depression narrower than upper face (i.e., distance from lateral margin of depression to eye); scrobal depression laterally with nearly parallel carinae that converge on midocellus ventrally and laterally (Fig. 29); midocellus not distinctly in scrobal depression); malar sulcus complete and obvious; intermalar distance about 3.0× malar distance; toruli slightly higher than wide, about 1.5× own diameter above ventral eye margin, separated from each other by ½ shortest torulus diameter; interantennal area with raised lamelliform carina extending within ocellus diameter of venter of midocellus; scape about 0.8× eye height, laterally compressed; ratio of scape : pedicel : anellus : F1 : F2 as 22:5:1:12:13; anellus wider than long; F1–2 as wide as pedicel, F1 about 4⅓ as long as wide, each segment becoming shorter to F7 2× as long as wide, covered with appressed, dense, bristles, none longer than width of segment; clava about 0.9× length of F6+7; ratio of ocellocular : postocellar : mid-to-lateral ocellus distance : lateral ocellus diameter about 16:14:5:12; frontovertex and transverse area behind ocelli slightly swollen (more pronounced posterolaterally); lateral ocelli slightly elevated medially, sitting in depression between frontovertex and transverse area, posteriorly margined by carina; wide furrow extending from lateral ocellus to eye outlined anteriorly by swollen frontovertex and posteriorly by posterolateral swellings (Fig. 29). *Mesosoma*: Pronotum with strong, transverse carinae, laterally smooth, about as long as wide, in lateral view slightly longer than high; mid- and lateral lobes of mesoscutum with strong transverse carinae (similar to pronotum); notaulus deeply grooved, meeting transscutal articulation at point outside (laterad) scutoscutellar suture, notaulus with transverse carinae delimiting shallow pits; side lobes with parapsidal line present, finely granulose, not extending almost to apical margin (Fig. 10; separated from apex by length at least longer than own narrowest width), interrupting transverse carinae; apical margin of scutellum essentially contiguous with transscutal articulation except a single median pit present; axillae with diagonally curving carinae; scutellum dorsally flat, weakly transversely carinate anteriorly; frenal line absent but frenal area indicated by colored line and weak, longitudinal carinae; ratio scutellum length : frenum length about 2.5:1; scutellum posteriorly with grooved, pitted lamella; propodeum (Fig. 36) with complete median carina; submedian carina arise from median carina, forming acute angle about ⅓ distance from metanotum, posteriorly joining inner margin of spiracular sulcus, area anterior to carina alveolate (resultant area is yellow and may appear as rounded yellow circle); area posterior to carina partially alveolate and partially nearly flat; spiracle about 0.5× own greatest length from apical edge of propodeum, about 2× own length from metapleuron, about 0.25× median length of propodeum; postspiracular sulcus deep and traversed by 4 or 5 strong carinae forming deep pits, inner (upper) edge carinate, forming a distinct ledge in lateral view; callus convex with long whitish setae set in irregular alveolate depressions; nucha a parallel-sided curved strip, with fine, parallel striae; mesepisternum smooth; femoral depression deep, well defined, with longitudinal carinae; transepimeral sulcus strongly defined from middle of epimeron to venter, entire epimeron longitudinally carinate; metapleuron with longitudinal carinae about as well developed as epimeron, posterior margin (abutting propodeum) de-

pressed in lower half with several longitudinal carinae creating deep pits; metatibial spurs (see Variation below); dorsal length (shortest) of metabasitarsus about 0.8× length of tarsomeres 2–5; all tarsal claws simple (as in Fig. 43); forewing ratio of submarginal vein : basal vein : marginal vein : postmarginal vein about 16:3:5:11; costal cell dorsally without setae on apical anterior edge, ventrally densely setose in apical ½, basal cell and cubital vein asetose; petiolate segment of stigmal vein subequal to stigmal height, stigma height 1.2× width (Fig. 19), ventral margin convex, uncus 3–5× as long as wide. *Metasoma*: Laterally compressed; ratio of mesosoma : metasoma : hypopygium about 11: 12:15.

Male.—Unknown.

Types.—Holotype ♀ with following data: Jesselton, North Borneo [= Kota Kinabalu, Sabah, Malaysia], K. L. Leong, 18 May 1959, "on pandan" (deposited in BMNH); 2 ♀ paratypes, same data as holotype (BMNH, USNM).

Variation.—The three females are essentially identical. The holotype has the right leg missing beyond the femur and the right shorter metatibial spur is missing. On the other specimens this spur is about 0.5× the longer spur.

Etymology.—From the Latin "*fascia*" meaning stripe or band in reference to the stripe on the posterior of the head.

Distribution.—Known only from Malaysia (Sabah).

Host.—The type specimens were collected on "pandan" (presumably *Pandanus*).

Discussion.—This species appears nearly identical to *B. maxima*. It shares the facial carinae reaching or nearly reaching the lateral ocellus, the swollen frontovertex, the median ocellus set within (or nearly) the scrobal depression, the lateral ocelli set in slightly depressed areas which extend to the eye, the presence of distinct parapsidal lines, the strong transverse carinae on the dorsum of the pronotum and mesoscutum, and the relatively small, nearly circular stigma. It differs in the following respects: the propodeum has a median carina (Fig. 36) (absent in *maxima*, Fig. 35); the sculpturing of the parapsidal line in dorsal view does not reach as far forward towards the anterior margin of the sidelobe (Fig. 10B) (in *maxima* the parapsidal line nearly touches the anterior margin, Fig. 9B); the dorsum of the head has a continuous band of black (or dark brown) extending across its posterior margin (Fig. 1) (in *maxima* there are 3 distinct spots, Fig. 2); the lateral ocelli are slightly raised and are set in a depressed area formed by the swollen frontovertex and posterior dorsum of head, they are outlined posteriorly by a distinct carina, and the furrow to the eye is wide and flat (Fig. 29) (in *maxima* the lateral ocelli are not raised above the surface but are set in a nearly flat plane that reaches to the occipital carina [raised swellings are present posterolaterad but not medially], there is no posterior carina, and the furrow to the eye is narrow, Fig. 30); the lateral carinae of the scrobal depression reach only the base or sides of the midocellus (Fig. 29) (in *maxima* the lateral carinae reach the dorsum of the midocellus, Fig. 30); and the uncus is 3 or more times as long as wide (Fig. 19) (in *maxima* the uncus is scarcely longer than wide, Fig. 16♀).

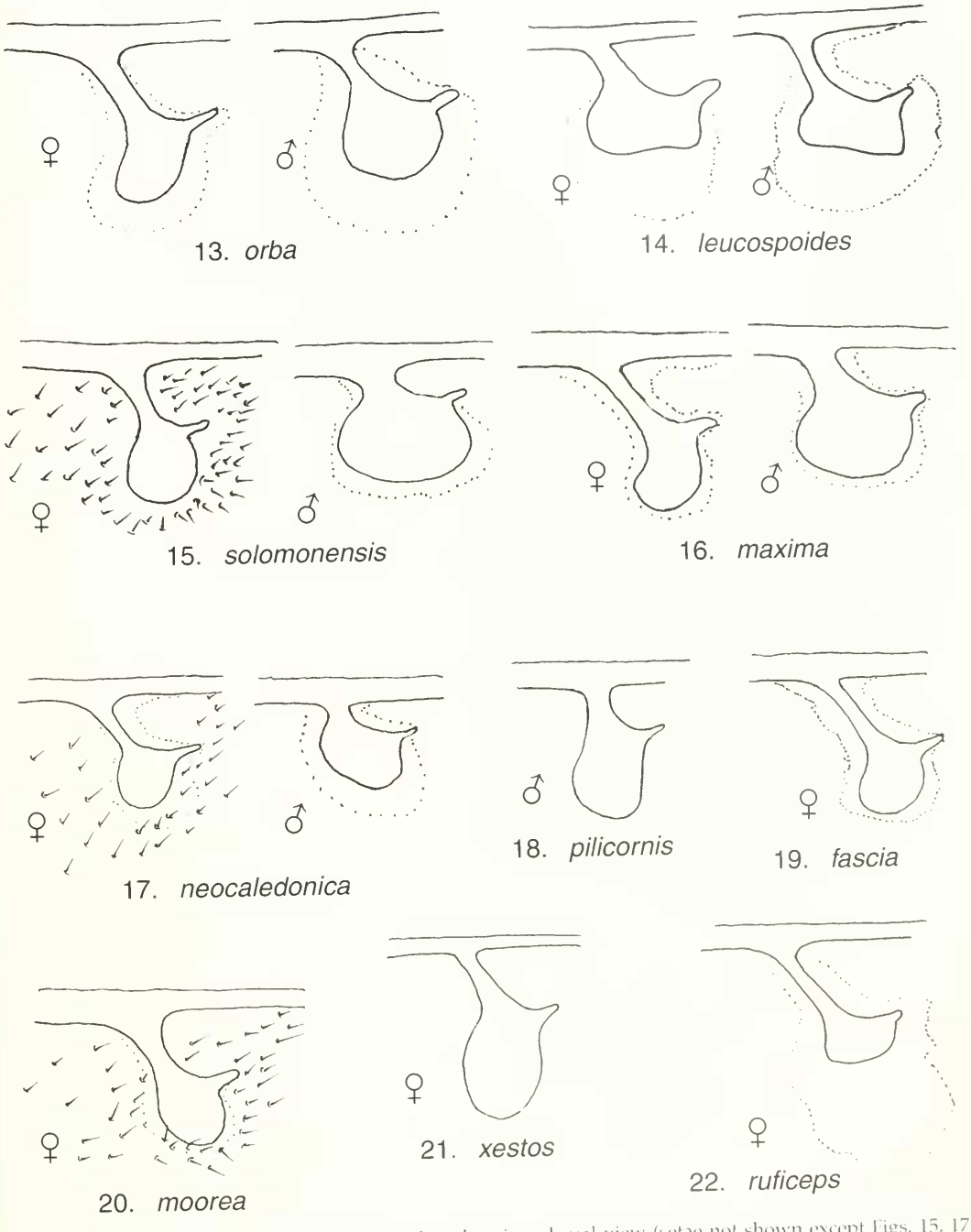
2. *Bootania gigantea* (Girault)

Figs. 28, 40, 43

Pulvilligera gigantea Girault 1928:3. Lectotype ♀, herein designated to ensure nomenclatural stability, Townsville, N. Q[ueensland] [G. F. Hill] [Australia] (QM, examined; missing head, left forewing; double-mounted on minutin and marked with E. E. Grissell identification label); 1 ♂ syntype, same data as ♀ (lost according to Dahms 1984).

Bootania gigantea (Girault): Transferred by Riek 1970:920.

Female (lectotype and specimens from Round Hill Head, see below).—Body length (excluding ovipositor) about 12 to 15 mm; ovipositor length about 20 to 25



Figs. 13–22. *Bootania* spp. Right forewing, stigmal region, dorsal view (setae not shown except Figs. 15, 17, and 20). Stigmal stain indicated by dotted line.

mm. *Color*: All yellow to yellow with following areas pale reddish brown: pronotum laterally; lateral lobe of mesoscutum including notaulus; axillae; prepectus; mesepisternum; metanotum laterad of dorsellum; metapleuron; darker reddish brown areas are: lower margin of face (including gena), propodeum; dark brown

are: funicle + clava, submarginal and stigmal veins, ovipositor sheath. *Head*: Barely wider than high; upper face swollen (Fig. 28); in dorsal view with facial setae shorter than greatest midocellus diameter and obviously not reaching inner eye margin (i.e., upper face with wide, bare area between setae and inner eye margin) (as in Fig. 24); face with carinae radiating from lower margin (excluding clypeus) to venter of toruli; genal area, postgenal area, and upper face smooth to finely reticulate; scrobal depression narrower than upper face (i.e., distance from lateral margin of depression to eye) (Fig. 28); scrobe in ventral half obscurely laterally carinate, carinae absent medially, several obscure carinae converge on midocellus ventrally and dorsally (Fig. 28; it is not clear if midocellus is in scrobal depression or not); malar sulcus present; intermalar distance about 2.0× malar distance; toruli as high as wide, venter about own diameter above ventral eye margin, separated from each other by about ½ torulus diameter, interantennal area a rounded lamelliform carina that continues as distinct but barely raised carina to venter of midocellus; scape about 0.9× eye height, laterally compressed; ratio of scape : pedicel : anellus : F1 : F2 about 4:1:0.2:1.5:1.5 (Fig. 40); anellus wider than long; F1–2 scarcely wider than pedicel, F1–5 each about 2× as long as wide, F6–7 each about 1.5× as long as wide, covered with appressed, dense bristles, each shorter than width of segment; clava shorter in length than F6+7; ratio of ocellocular : postocellar : mid-to-lateral ocellus distance : lateral ocellus diameter about 1.5:1:0.5:0.8. *Mesosoma*: Pronotum dorsally with transverse carinae, laterally smooth, in dorsal view slightly wider than long, in lateral view, slightly longer than high; mid- and lateral lobes of mesoscutum with transverse carinae (much closer together than on pronotum); notaulus deeply grooved, meeting transscutal articulation at point outside (laterad) scutoscutellar suture, notaulus with transverse carinae delimiting shallow pits; parapsidal line barely discernible as depression, transverse carinae somewhat distorted in depression, but not interrupted by granulose sculpture; apical margin of scutellum widely contiguous with transscutal articulation; scutellum smooth, flat; frenal line absent; scutellum posteriorly with narrow lamella with narrow, smooth groove; propodeum apically with median carina that diverges widely posteriorly and reaches postspiracular sulcus (as in Fig. 34), medially with several parallel transverse carinae; spiracle about ½ own greatest length from apical edge of propodeum, about 1.5× own length from metapleuron, about ¼ median length of propodeum; postspiracular sulcus deep and traversed by 1 or 2 strong carinae forming deep pits; metanotum posterolaterally lamellate, with longitudinal groove crossed by vertical carinae, deep pit laterad of dorsellum; dorsellum convex, smooth, not projecting; callus with few, long, whitish setae; nucha a narrow band, indicated laterally, indistinct medially; mesepisternum smooth to weakly reticulate, femoral depression shallow weakly sculptured, transepimeral sulcus a weakly developed pit, posterior half of mesepimeron with weak longitudinal carinae; metapleuron with well developed longitudinal carinae about as developed as on lateral margins of propodeum; dorsal length (shortest) of metabasitarsus about ½ length of tarsomeres 2–5; inner metatibial spur slightly curved, about 3× as long as outer; tarsal claws simple (Fig. 43); forewing ratio of submarginal vein : basal vein, marginal vein : postmarginal vein as about 7:1.5:2:4; costal cell without setae dorsally, ventrally with several rows of setae at distal $\frac{1}{5}$, basal cell and cubital vein asetose; petiolate part of stigmal vein nearly 1.5× stigmal height, stigma height about 0.6× width, ventral margin convex, uncus longer than wide. *Metasoma*: Laterally compressed; ratio of mesosoma : metasoma : hypopygium about 1:1:1.

Male (from Round Hill Head).—Body length about 10 to 12 mm. Similar in coloration and sculpture to female, except base of metasoma and edges of some terga may be reddish brown. Ratio of scape: pedicel: anellus: F1: F2 about 5:1:0.2:2:2, F1–7, each spindle-shaped, about 3× as long as wide, with 2 to 3 whorls of semierect setae as long as funicular segment; clava distinctly wider than funicle, slightly longer than F6+7, covered with short, appressed setae (as in female); petiolate part of stigmal vein about 0.6× stigmal height, stigma about 2× as wide as high; metasoma dorsoventrally compressed.

Material examined.—In addition to the lectotype ♀ we have seen the following material: 30 ♀, 29 ♂, Round Hill Head, Queensland, Australia, em. 10 Oct. to 7 Nov. 1997 from *Pandanus* seeds coll. 7 Sept. 1997, M. S. Upton (ANIC); 1 ♀, Eet Hill, vicinity Moa (Banks) Is., Torres Str., N. Qld, July 9–13 1977, G. B. Monteith and D. Cook (QM); 1 ♂, Coolum, 20-4-38, F. A. Perkins [Queensland] (UQ), 1 ♂, same data but 20-11-38 (ANIC); 1 ♀, Witsunday Is., N. Geary, Jan 1934 [Queensland] (QM); 1 ♂, Brisbane, Queensland, 17-3-36, H. Hacker; 1 ♀, Caloundra, Queensland, 30-3-34, H. Hacker (ANIC).

Distribution.—This species is known from a few localities in Queensland, Australia. Most are on the eastern coast near Brisbane, but one record is from the extreme northern tip of Queensland.

Host.—The species was reared from *Pandanus* seeds.

Discussion.—Dahms (1984) discussed the syntypes of which the male is missing. *Bootania gigantea* is easily distinguished from the other 2 known Australian species (i.e., *titanus, xestos*) by the all yellow dorsum of the head (mostly black in *titanus*, all black in *xestos*). It differs from *xestos* in a number of additional characters (mostly autapomorphies for *xestos*) as outlined under that species. It is difficult to compare to *titanus* because that species is known only from a badly broken single female and all the facial and antennal characters are unknown. The prododea of the two differ as described in the key. *Bootania gigantea* differs from non-Australian species in having a combination of a complete lamelliform interantennal area, nearly smooth upper facial swellings, and lower face with carina extending to venter of the toruli (Fig. 28).

3. *Bootania leucospoides* (Walker)

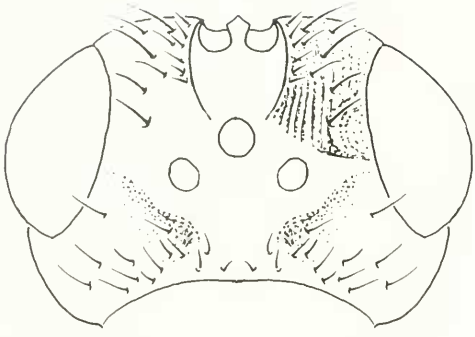
Figs. 6, 14, 44

Metamorpha leucospoides Walker 1862:347. Lectotype ♀, "Bootan" (BMNH, designated by Boucek 1988:127, examined). [Missing are: left antenna beyond pedicel; right antenna beyond F2; right protarsus; left protarsus beyond tarsomere 2; both metatarsi beyond tarsomere 2.]

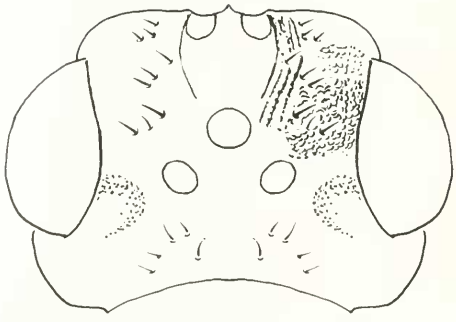
Metamorpha leucospidioidea: Rye 1874:362, incorrect subsequent spelling.

Bootania leucospoides: Transferred by Dalla Torre 1897:86.

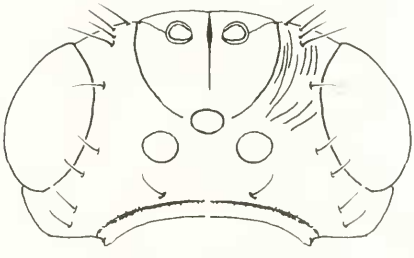
Female lectotype.—Body length (excluding ovipositor) 10 mm; ovipositor length 21 mm. *Color*: Brownish yellow with following areas black (Fig. 6): upper margin of clypeus, median stripe to toruli narrowing dorsally; scrobe; area around ocelli, line descending into scrobe; stripe from ocellar area to dorsoposterior corner of eye; band extending around ocelli posteriorly to occipital foramen; pronotum in anterior half posteriorly branching into 2 bands along dorsolateral margins and around lateral margins, with median stripe extending to scutum; midlobe of mesoscutum medially; notuali; lateral lobe of mesoscutum with dorsolateral longitudinal band; anteriolateral portion of axillae; scutellum medially branching into stripes that run along anterior margin of frenum, and diffuse medial stripe on frenum; metanotum with spots laterad of dorsellum; propodeum dark reddish brown; femoral depression; venter of mesonotum; mesopleuron; outer surface of metacoxa; metafemur completely; tergum 1 mostly red-brown, terga 2–6 dark brown



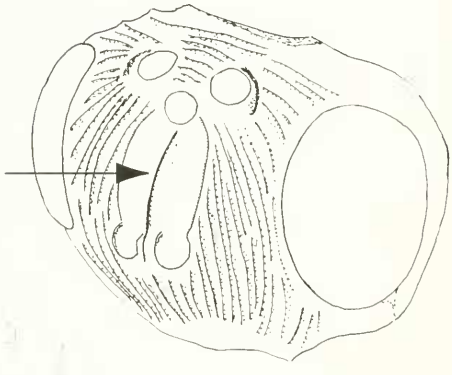
23. *solomonensis*



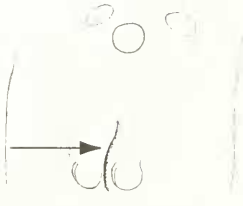
24. *neocaledonica*



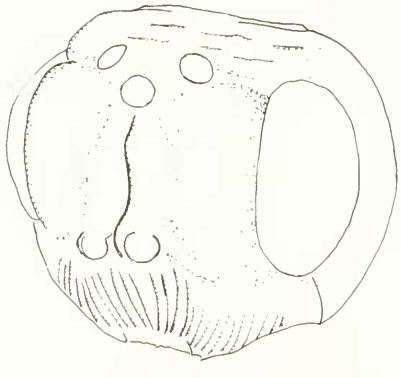
25. *xestos*



26. *orba*



27. *moorea*



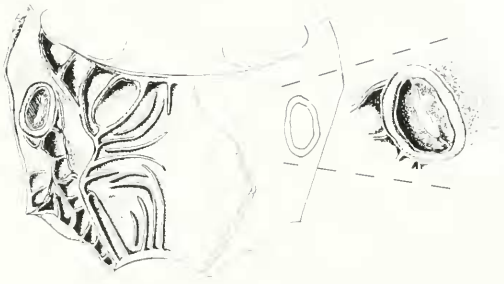
28. *gigantea*

29. *fascia*

30. *maxima*

Figs. 23–30. *Bootania* spp., heads. 23–25, Dorsal view. 26–28, Three-quarter dorsal view (27 showing interantennal area only). Arrow = interantennal carina. 29–30, Dorsal view, ocellar area only.

to black with off-white vertical band along anterior margin, widening ventrally; wing veins dark brown, stigma surrounded by narrow brown band (Fig. 14 ♀), forewing with apparent brown stain in basal ⅓, extending along vein track of cubital and medial setal lines to margin of wing. *Head*: Wider than high (4:3.5); upper face swol-



31. *xestos*

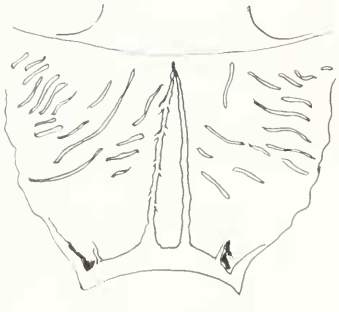
32. *ruficeps*

33. *orba*

34. *neocaledonica*

35. *maxima*

36. fascia



37. *moorea*

Figs. 31–37. *Bootania* spp. Propodeum, dorsal view. 31, 33, Inset, enlargement showing spiracle.

len, finely reticulate; in dorsal view with facial setae shorter than greatest midocellus diameter and obviously not reaching inner eye margin (i.e., upper face with wide, bare area between setae and inner eye margin) (as in Fig. 24); face with faint carinae radiating from apical part of clypeus to venter of torulus; genal area, postgenal area, and area laterad lateral ocellus smooth; scrobal depression narrower than

upper face (i.e., distance from lateral margin of depression to eye); scrobe carinate laterally, fading dorsally, not extending to midocellus (i.e., midocellus not in scrobal depression); carinae present from upper swelling to venter of lateral ocellus; malar sulcus present; toruli slightly higher than wide, venter about own long diameter above ventral eye margin, separated from each other by ½ torulus diameter, interantennal area a rounded lamelliform carina not extending dorsad of toruli; intermalar distance about 2.5× malar distance; scape 0.9× eye height, laterally compressed; ratio of scape : pedicel : anellus : F1 : F2 as 5:1:0.3:3:3; anellus as long as wide, F1, F2 as wide as pedicel [other measurements not taken], with appressed, dense, bristles, each less than width of segment; ratio of ocellocular : postocellar : mid-to-lateral ocellus distance : lateral ocellus diameter as 5:2:0.8:2; vertex slightly swollen, ocelli in slight depression, weak furrow extending from lateral ocellus to eye. *Mesosoma*: Pronotum dorsally and laterally smooth, without carinae, in dorsal view slightly wider than long, in lateral view, slightly longer than high; mid- and lateral lobes of mesoscutum smooth; notaulus deeply grooved, meeting transscutal articulation at same point as scutoscutellar suture, notaulus and scutoscutellar groove with transverse carinae delimiting deep pits; parapsidal line absent; apical edge of scutellum reaching transscutal articulation at median point, narrowly contiguous (i.e., appearing as acute angle) with deep pit on either side; scutellum smooth, flat, frenal line indistinct except at lateral edges (transverse translucent line indicates where frenal line would be if present), ratio scutellum length : frenum length about 3:1; scutellum posteriorly with wide lamella rimmed by distinct pits; propodeum with numerous irregular carinae, dorsally with single asymmetric median carina, laterally with irregular carina reaching to nucha and encircling median area of anastomosing carinae; spiracle about 0.75× own greatest length from apical edge of propodeum, about 1.5× own length from metapleuron, about 0.25× median length of propodeum; postspiracular sulcus deep and traversed by 1 or 2 strong carinae forming deep pits; dorsellum convex, smooth, slightly projecting which creates overhang with flat to slightly depressed surface; callus with moderately dense, long, whitish setae; nucha a distinct raised band; mesepisternum smooth; femoral depression deep with well-delimited transverse carinae; transepimeral sulcus well-developed, indicated by a deep depression with pits created by cross-carinae; mesepimeron and metapleuron with strong longitudinal carinae; metatibial spurs slightly curved, longer spur about 2× length of shorter spur; all claws bifurcate (Fig. 44); forewing ratio of submarginal vein : basal vein : marginal vein : postmarginal vein as 6:1:2:6; costal cell without setae dorsally, ventrally with numerous setae along anterior margin and distal ½, basal cell with cluster of dorsal setae apically, cubital vein asetose; petiolate segment of stigmal vein about 0.5× stigmal height, stigma height 0.5× width (Fig. 14♀), uncus about 2× as long as wide; venter of stigma concave (Fig. 14♀). *Metasoma*: Laterally compressed; ratio of mesosoma : metasoma : hypopygium about 1:1:1.

Male (from Burma).—Body length 10.8 mm. Similar to female except: metacoxa and metafemur yellowish brown; off-white bands on tergites wider; no circles present on lateral margins of pronotum, only dorsolateral stripe; frenum entirely yellowish brown. F1–7 each spindle-shaped, about 7× as long as wide, with several whorls of semierect setae shorter than length of segment; clava distinctly wider than funicle [length not taken], with dense short appressed setae; metasoma dorsoventrally compressed. Stigma see Fig. 14♂.

Variation.—The Burma specimens have setose eyes. This condition is not apparent

on the lectotype in which the setae may have broken off.

Material examined.—Lectotype ♀, Bootan (BMNH, designated by Boucek 1988); 1 ♀, 1 ♂, Maymyo, Mandalay Dist., Burma, M. H. Desai Coll., 28.VII.1931 (BMNH, det. Ferriere).

Distribution.—Specimens are known only from Bhutan and Burma.

Host.—The species has been reared from *Pandanus*.

Discussion.—Milliron (1949: 348) discussed the nomenclature of this name and stated that *leucospidioidea* was incorrectly credited to Westwood (1874: 136) by Dalla Torre (1898: 315) when it should have been credited to Rye (1874: 362). Narendran (1994: 34–35, Figs. 26–29) redescribed the lectotype. According to Boucek (1988: 127) the record for this species is questionably Butung Island, southeast of Celebes. Narendran (1994) disagreed with this interpretation and so did Grissell (1999). According to the Harper's Gazetteer of the world (Smith 1855) Bootan (also spelled Bhotan) was the area that now corresponds to Bhutan. According to Boucek (1988: 127) the locality of Assam (India) given by Dalla Torre (1898: 315) is incorrect. This locality was not given by Walker (1862), but Assam borders Bhutan on the south and east, and so should not be dismissed outright.

Bootania leucospoides is the only species known to have bifurcate claws (Fig. 44), and in both sexes the stigmal vein is somewhat concave on the ventral margin (Fig. 14). The female is especially distinct in having the stigma much wider than high (Fig. 14♀).

4. *Bootania maxima* (Strand)
Figs. A, 2, 3, 9, 16, 30, 35

Pulvilligera maxima Strand 1911:59. 6 ♂ syntypes, Taihanroku, Formosa [Republic of China] [ZMB, 3 examined].

Bootania maxima: Transferred by Riek in Kamijo 1962:36.

Female.—Body length (excluding ovipositor) 8 to 15 mm; ovipositor length 20 to 30 mm. *Color*: Orange to brownish orange (or rarely yellow) with brown to black markings as follows (Fig. 2): narrow median stripe from clypeus to interantennal area; transverse stripe through ocelli to eye, spot posterolateral to lateral ocellus, spot posterior to median ocellus with stripe running to occipital foramen (Fig. 16); irregular spot between eye and oral fossa at malar sulcus; postgenal area; pronotum with median and lateral longitudinal stripes; midlobe of mesoscutum with median dark brown longitudinal stripe; lateral lobe of mesoscutum with median longitudinal stripe ranging from faint indication (limited to median area of lobe) to black (extending from apical to posterior margins); notaulus; scutellum with dark brown longitudinal stripe medially extending from apical margin to frenal line or to posterior of frenal area; lateral panel of axilla with faint longitudinal patch; femoral depression; propodeum medially to nearly entirely except for submedian yellow spots; metasoma ranging from all orange to nearly black with 2 to 4 lateral yellow spots laterally. *Head*: Wider than high (9:8); upper face bulging slightly; in dorsal view with facial setae shorter than greatest midocellus diameter and obviously not reaching inner eye margin (i.e., upper face with wide, bare area between setae and inner eye margin) (as in Fig. 24); face with carinae extending from lower margin (excluding clypeus) to venter of lateral ocelli; genal area, postgenal area, and scrobal depression smooth; scrobal depression narrower than upper face (i.e., distance from lateral margin of depression to eye) (Fig. 30); scrobal depression laterally with multiple carinae that converge on midocellus ventrally and dorsally (Fig. 30; midocellus appears to be in scrobal depression, but if not readily apparent, then at least several carinae converge on it laterally and dorsally); malar sulcus complete and obvious; intermalar distance about 2.5× malar distance; toruli

slightly higher than wide, separated from each other by ½ shortest torulus diameter; interantennal area a raised lamelliform carina extending within an ocellus diameter of venter of midocellus (though it may be effaced somewhat at its midpoint); scape about 0.7× eye height, laterally compressed; ratio of scape : pedicel : anellus : F1 : F2 as 25:7:2:13:13; anellus wider than long; F1–2 as wide as pedicel, F1–7 each about 3–3.5× as long as wide, covered with appressed, dense, bristles, none longer than width of segment; clava about 0.8× length of F6+7; ratio of ocellocular : postocellar : mid-to-lateral ocellus distance : lateral ocellus diameter about 10:10:5:7; vertex with slightly swollen carinate area posterolaterad of lateral ocellus; lateral ocelli sitting in nearly flat plane extending from anterior ocellus to occipital carina (between posterolateral swellings); narrowed furrow extending from lateral ocellus to eye outlined anteriorly by swollen frontovertex and posteriorly by posterolateral swellings (Fig. 30). *Mesosoma*: Pronotum with strong, transverse carinae (Fig. 3, 9), laterally smooth, about as long as wide, in lateral view slightly longer than high; mid- and lateral lobes of mesoscutum with strong transverse carinae (similar to pronotum); notaulus deeply grooved, meeting transscutal articulation at point outside (laterad) scutoscutellar suture, notaulus with transverse carinae delimiting shallow pits; side lobes with parapsidal line present, finely granulose, extending almost to apical margin (Fig. 9A, B), interrupting transverse carinae; apical margin of scutellum contiguous with transscutal articulation except a single median pit may be present; axillae with diagonally curving carinae; scutellum dorsally flat, weakly transversely carinate anteriorly; frenal line absent but frenal area indicated by colored line and weak, longitudinal carinae (Fig. 2); ratio scutellum length : frenum length as 3:1; scutellum posteriorly with grooved, pitted lamella; propodeum (Fig. 35) without median carina, several submedian carinae curve toward posterolateral margin of propodeum forming depression in anterior ⅓, area anterior to carina alveolate (resultant area is yellow and may appear as subrounded yellow circles if propodeum is largely black); spiracle about 0.5× own greatest length from apical edge of propodeum, about 2× own length from metapleuron, about 0.20× median length of propodeum; postspiracular sulcus deep and traversed by 3 or 4 strong carinae forming deep pits, inner edge not carinate or forming a distinct ledge in lateral view; callus convex with long whitish setae set in irregular alveolate depressions; nucha a parallel-sided curved strip, with fine, parallel striae; mesepisternum smooth; femoral depression deep, well defined, with longitudinal carinae; transepimeral sulcus strongly defined from middle of epimeron to venter, entire epimeron longitudinally carinate; metapleuron with longitudinal carinae about as well developed as epimeron, posterior margin (abutting propodeum) depressed in lower half with several longitudinal carinae creating deep pits; metatibial spurs straight, longer spur about 2× length of shorter spur; dorsal length (shortest) of metabasitarsus subequal to length of tarsomeres 2–5; all tarsal claws simple (as in Fig. 43); forewing ratio of submarginal vein : basal vein : marginal vein : postmarginal vein about 5.5:1:2.3:4.5; costal cell dorsally with 1 or 2 setae on apical anterior edge, ventrally densely setose in apical ½, basal cell and cubital vein asetose; petiolate segment of stigmal vein about 0.8× stigmal height, stigma height 1× width (Fig. 16♀), ventral margin convex, uncus as wide as long. *Metasoma*: Laterally compressed; ratio of mesosoma : metasoma : hypopygium about 7:6:8.

Male.—Body length 9 to 12 mm. Similar to female except: median longitudinal black line on pronotum faint on some specimens; ratio of scape : pedicel : anellus : F1 : F2 about; F1–7 each spindle-shaped, about 6× as long as wide, with 2 to 3

whorls of erect setae as long as funicular segment; clava distinctly wider than funicle, slightly longer than F6+7, covered with short, appressed setae (as in female); petiolate segment of stigmal vein about 0.4× stigmal height, stigma height 0.7× width (Fig. 16♂), ventral margin convex; metasoma dorsoventrally compressed.

Material examined.—In addition to the 3 ♂ syntypes from Republic of China (ZMB), we have also seen the following: 65 ♀, 56 ♂, mouth of Evelyn River, Guadalcanal, 23 August to 9 September, 1944, H. Milliron, ex *Pandanus* seeds (USNM).

Distribution.—This species is known from the Republic of China in the north and the Solomon Islands (Guadalcanal) in the south.

Host.—The syntypes were not reared. Based on specimens from Guadalcanal (USNM) described by Milliron (1950) this species was reared from seeds of *Pandanus upoluensis* Martelli, but the original labels on the specimens state only *Pandanus*.

Discussion.—Milliron (1950) saw no type material. He described the female, redescribed the male, and illustrated the stigmal venation of both sexes (his figs. 2–3) based on specimens from Guadalcanal. We have compared these specimens with 3 syntype males and they are conspecific. We did not designate a lectotype for this species because we saw only part of the series. The species was transferred to *Bootania* by implication (Riek in Kamijo 1962: 36).

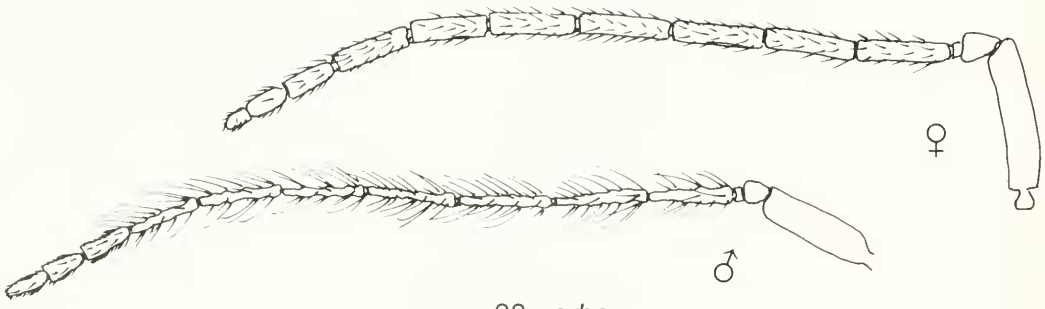
The 121 specimens from Guadalcanal and 3 specimens from Republic of China differ little in color pattern, except a few males may have the black areas absent along the lateral margins of the pronotum and most of the ocellar area (at least the lateral brownish spots remain posterior to the lateral ocelli and around the median ocellus).

This is among the largest of chalcidoid wasps, reaching 4.5 cm in length with the exserted ovipositor. The species is most similar to *B. fascia* and diagnostic characters are discussed under that species.

5. *Bootania moorea* Desjardins and Grissell, new species

Figs. 20, 27, 37, 42

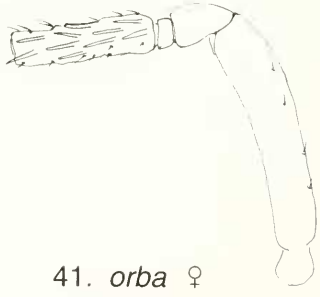
Female holotype.—Body length (excluding ovipositor) about 9 mm; ovipositor length about 15 mm. *Color*: Pale yellowish brown with following areas reddish brown: lateral longitudinal stripes on pronotum and lateral lobes of scutellum, eyes, circle directly surrounding ocelli; brown areas are: median longitudinal stripe on posterior half of pronotum which becomes a faint V-shaped ending at posterolateral margins of neck, posterior half of scutum, and scutellum anterior to frenum; anterior margin of propodeum; postspiracular sulcus; dorsal surface of scape and pedicel; stripe connecting lateral ocelli to median ocellus; eyes; dark brown areas are: flagellum; anterodorsal region of first metasomal tergite; ovipositor sheath; wing veins. *Head*: Barely wider than high; upper face swollen; in dorsal view with facial setae shorter than greatest midocellus diameter and obviously not reaching inner eye margin (i.e., upper face with wide, bare area between setae and inner eye margin) (as in Fig. 24); face with minute longitudinal carinae radiating from lower margin (excluding clypeus) to venter of toruli; vertex with minute longitudinal carinae radiating from ocellar triangle; genal area, postgenal area, and scrobal depression smooth; scrobal depression narrower than upper face (i.e., distance from lateral margin of depression to eye); scrobe not carinate laterally (i.e. midocellus not in scrobal depression); malar sulcus complete; intermalar distance about 2.5× malar distance; toruli slightly higher than wide, venter about 1.8× own diameter above ventral eye margin, separated from each other by ½ torulus diameter, interantennal area (Fig. 27) a rounded lamelliform carina that terminates less than ½ way to midocellus; scape about



38. *orba*

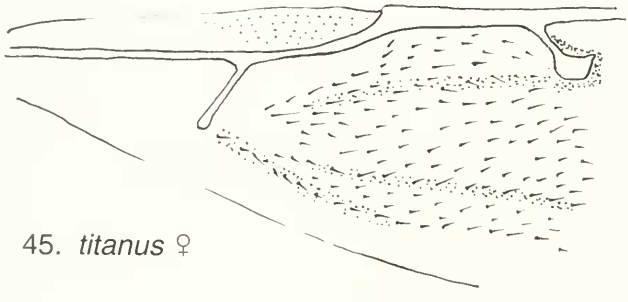
39. *xestos* ♀

40. *gigantea* ♀



41. *orba* ♀

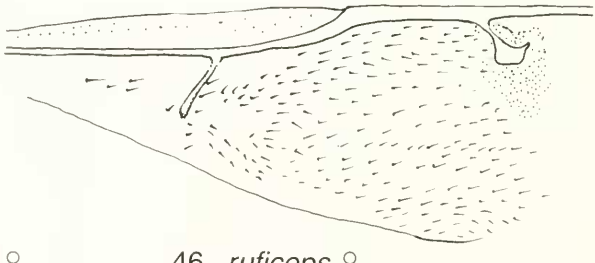
42. *moorea* ♀



45. *titanus* ♀

43. *gigantea* ♀

44. *leucospoides* ♀



46. *ruficeps* ♀

Figs. 38–46. *Bootania* spp. 38–42, Antenna, lateral view. 38, Entire. 39–42, Scape, pedicel, anellus, flagellomere 1. 43–44, Apical hindtarsus with claw (empodium not shown). 45–46, Forewing, dorsal view.

0.75× eye height, laterally compressed; ratio of scape : pedicel : anellus : F1 : F2 about 3.5:1:0.2:2:2.2; anellus wider than long; F1–2 scarcely wider than pedicel, F1–4 each about 4× as long as wide, antennae broken beyond F4 (but in paratype F1–6 about 4× as long as wide, F7 about 3× as long as wide; clava about 0.8× length of F6+7), covered with appressed, dense bristles, each shorter than width of segment (Fig. 42); ratio of ocellocular : postocellar : mid-to-lateral ocellus distance : lateral ocellus diameter about 0.9:1:0.5:0.5. *Mesosoma*: Pronotum dorsally with faint transverse carinae, laterally smooth, in dorsal view barely longer than wide, in lateral view, slightly longer than high; mid- and lateral lobes of mesoscutum with faint transverse carinae (similar to pronotum); nettles deeply grooved, meeting transscutal articulation at point outside (laterad) scutoscutellar suture, nettles with transverse carinae delimiting deep pits; parapsidal line absent; apical margin of scutellum contiguous with transscutal articulation; scutellum with minute transverse carinae anterior to frenum; frenal line distinct laterally but indiscernible medially; ratio of scutellum length : frenum length 1.1:1; scutellum posteriorly with narrow lamella and groove with well defined pits; propodeum (Fig. 37) weakly carinate; spiracle about 0.75× own length from apical margin of propodeum, about 1.4× own length from metapleuron, about 0.25× median length of propodeum; postspiracular sulcus deep and traversed by 2 strong carinae forming deep pits; callus as wide as postspiracular sulcus, with effaced transverse carinae and long, widespaced setae; dorsellum convex, smooth, not projecting; nucha a broad, well-defined band; mesepisternum smooth, delimited dorsally by strongly carinate ventral margin of femoral depression; femoral depression moderately shallow, well defined, with transverse carinae; transepimeral sulcus strongly developed from dorsal ⅔ of epimeron to venter, with transverse carinae forming shallow pits, epimeron longitudinally; metapleuron with weak transverse carinae, posterior margin (abutting propodeum) deeply depressed with several longitudinal carinae creating deep pits; tarsi broken beyond tarsomere 3; tarsal claws simple (as in Fig. 43); inner metatibial spur slightly curved, about 3× as long as outer spur; forewing ratio of submarginal vein : basal vein : marginal vein : postmarginal vein about 4.7:1:1.8:3; costal cell without setae dorsally, ventrally with 3 to 4 rows of setae at distal ½, more tightly spaced anteriorly than ventrally; basal cell with small cluster of setae on dorsal surface anterior to distal ½ of basal vein, cubital vein bare proximal to basal vein; petiolate segment of stigmal vein about 0.8× stigmal height, stigma about 1.1× as high as wide (Fig. 20), surrounded by narrow translucent brown band, ventral margin convex, uncus about 3× as long as wide. *Metasoma*: Laterally compressed; ratio of mesosoma : metasoma : hypopygium about 1:1:1.1.

Male.—Unknown.

Types.—Holotype ♀ with following data: [French Polynesia] Moorea, 20-IX-86, emerged from unripe *Pandanus* fruit, coll. M. Lee (deposited in USNM); 1 ♀ paratype, same data as holotype (USNM).

Etymology.—Named for the island of Moorea.

Distribution.—Known only from the French Polynesia island state of Moorea.

Host.—The type specimens were reared from seeds of *Pandanus*.

Discussion.—*Bootania moorea* may be distinguished by the propodeum that has two complete submedian carinae (Fig. 37), by the interantennal area not reaching more than half way to the midocellus (Fig. 27), and by the partially setose stigmal area (Fig. 20). Morphologically it is most similar to *neocaledonica*. Both species have a fairly small stigma with relatively asetose area between the uncus and the postmarginal vein (cf. Figs. 17, 20). They can

be separated by characters given in the key.

6. *Bootania neocaledonica* (Milliron)
Figs. 17, 24, 34

Pulvilligera neo-caledonica Milliron 1950:350–352. Holotype ♀, Poindimie, New Caledonia (USNM, lost); 2 ♀, 2 ♂ paratypes same data as holotype (USNM, examined).

Bootania neocaledonica: Transferred by Bouček 1988:128.

Female paratypes.—Body length (excluding ovipositor) about 9 to 10 mm; ovipositor length about 18 mm. *Color*: Yellowish brown with following areas reddish brown: lateral longitudinal stripes on pronotum and lateral lobes of scutum, vertex, eyes, metasomal tergites; dark brown areas are: median longitudinal stripe on pronotum, scutum, and scutellum just prior to posterior edge; propodeum; anterodorsal region of first metasomal tergite; dorsal surface of scape and pedicel; flagellum; ovipositor sheaths; wing veins. *Head*: Barely wider than high; upper face swollen (as in Fig. 28); in dorsal view with facial setae shorter than greatest midocellus diameter and obviously not reaching inner eye margin (i.e., upper face with wide, bare area between setae and inner eye margin) (Fig. 24); face with obscure longitudinal carinae radiating from lower margin (excluding clypeus) to venter of swollen area, where sculpture varies from obscurely reticulate to obscurely carinate; genal area, postgenal area, and head behind eyes smooth; scrobal depression narrower than upper face (i.e., distance from lateral margin of depression to eye) (Fig. 24); scrobe carinate laterally, extending to dorsum of midocellus (i.e. midocellus in scrobal depression); malar sulcus complete; intermalar distance about 3× malar distance; toruli slightly higher than wide, venter slightly higher than own diameter above ventral eye margin, separated from each other by ½ torulus diameter, interantennal area a rounded lamelliform carina reaching less than ½ way to midocellus (as in Fig. 27); scape about 0.7× eye height, laterally compressed; ratio of scape : pedicel : anellus : F1 : F2 about 3.8:1:0.3:2.1:2.1; anellus wider than long; F1–2 as wide as pedicel, F1–5 each about 3× as long as wide, F6–7 about 2× as long as wide, covered with appressed, dense bristles, each shorter than width of segment; clava shorter in length than F6+7; ratio of ocellocular : postocellar : mid-to-lateral ocellus distance : lateral ocellus diameter about 0.9:1:0.4:0.5. *Mesosoma*: Pronotum dorsally with transverse carinae, laterally smooth, in dorsal view slightly longer than wide, in lateral view, longer than high; mid- and lateral lobes of mesoscutum with transverse carinae (similar to pronotum); notaulus deeply grooved, meeting transscutal articulation at point outside (laterad) scutoscutellar suture, notaulus with transverse carinae delimiting deep pits; parapsidal line absent; apical margin of scutellum widely contiguous with transscutal articulation, separated by groove with longitudinal carinae delimiting pits; scutellum smooth, slightly convex; frenal line indiscernible; ratio of scutellum length : frenum length 1.6:1; scutellum posteriorly with marginal rim lamelliform and groove with well defined pits; propodeum (Fig. 34) apically with median carina that branches widely posteriorly with each branch reaching postspiracular sulcus, several complete or incomplete transverse carinae present medially, two longitudinal carinae project ½ to dorsellum; spiracle about 0.6× own length from apical margin of propodeum, about 1.1× own length from metapleuron, about 0.25× median length of propodeum; postspiracular sulcus deep and traversed by 6 or 7 strong carinae forming deep pits; callus slightly wider than postspiracular sulcus anteriorly, but much narrower posteriorly, with effaced transverse carinae and long, widespaced setae; dorsellum convex, smooth, slightly projecting; nucha a broad, well defined band; mesepisternum smooth, delimited dorsally by

strongly carinate ventral margin of femoral depression; femoral depression moderately shallow, well defined, with transverse carinae; transepimeral sulcus strongly developed from dorsal ⅔ of epimeron to venter, entire epimeron longitudinally carinate anteriorly to transversely carinate posteriorly; metapleuron with longitudinal carinae, posterior margin (abutting propodeum) deeply depressed with several longitudinal carinae creating deep pits; dorsal length (shortest) of metabasitarsus about 0.6× length of tarsomeres 2–5; tarsal claws simple; inner metatibial spur straight, about 2× as long as outer spur; forewing ratio of submarginal vein : basal vein : marginal vein : postmarginal vein about 5.5:1:1.9:4; costal cell without setae dorsally, ventrally with 2 to 3 rows of setae at distal ½; basal cell with several setae on dorsal surface adjacent to midpoint of basal vein, cubital vein bare; petiolate segment of stigmal vein about 0.9× stigmal height, stigma about 1.1× as high as wide (Fig. 17♀), surrounded by narrow translucent brown band, ventral margin convex, uncus about 4× as long as wide. *Metasoma*: Laterally compressed; ratio of mesosoma : metasoma : hypopygium about 1.1:1:1.

Male paratypes.—Body length 9.0 to 10.0 mm. Similar to female except dorsum of metasoma dark brown. Ratio of scape : pedicel : anellus : F1 : F2 as 5:1:0.4:4.5:4.8, F1–7 each cylindrical, about 6 to 7× as long as wide, with 3 to 5 whorls of outstanding setae which are about 0.8× length of segment; clava barely wider than funicle, about 0.6× length of F6+7, covered with short appressed setae; pronotum with transverse carinae obvious; costal cell with numerous rows of setae along anterior margin of ventral surface, in addition to many setae in distal half; petiolate section of stigmal vein (Fig. 17♂) about 0.2× as long as stigmal height, stigma about 0.8× as high as wide, roundish, surrounded by brown stain extending posteriorly half as far as stigmal height; uncus about 3× as long as wide; propodeal nucha a narrow but distinct band, indicated laterally, indistinct medially; metasoma ventrally compressed.

Material examined.—The holotype of *neocaledonica* is supposed to be in the USNM (Milliron 1950:351–352). Although the remainder of the type series (2 ♀, 2 ♂ clearly marked as allotype and paratypes) is in the collection, the holotype cannot be found in either the type collection or the main collection. The type catalog lists 5 specimens as having been entered, including the holotype. The holotype, therefore, must now be considered lost.

Distribution.—Specimens are known from New Caledonia and perhaps Fiji (see discussion).

Host.—According to Milliron (1950) the types were reared from seeds of *Pandanus tectorius* var. *neocaledonicus* Martelli, but the original labels on the specimens state only *Pandanus*.

Discussion.—Milliron (1950) stated that he had seen one additional male from Suva, Fiji. The specimen is extant (USNM), and we have seen it but it differs from typical *B. neocaledonica* in having the interantennal area developed as a carina reaching to the midocellus. This single male specimen appears similar to *B. gigantea*, but differs in some aspects of the stigma, interantennal area, and propodeum. At present we cannot place this single, fragmentary specimen from Fiji.

Bootania neocaledonica is among the species without a well-developed interantennal area and is morphologically most similar to *moorea*. Both species have a fairly small stigma with relatively asetose area between the uncus and the postmarginal vein (cf. Figs. 17, 20). They differ (as described in the key) in characters found in the stigmal area (cf. Figs. 17 and 20) and on the propodeum (cf. Figs. 34 and 37).

7. *Bootania orba* Desjardins and Grissell, new species

Figs. 7, 8, 11, 13, 26, 33, 38, 41

Female holotype.—Body length (excluding ovipositor) 5.4 mm; ovipositor length

10.8 mm. *Color*: Pale yellow to brownish yellow with brown and off-white markings as follows (Fig. 7): brown patch between scrobe and eye, and encompassing ocelli; pronotum with brown median and lateral longitudinal stripes fading out toward anterior and posterior edges (off-white between stripes); midlobe of mesoscutum with median dark brown longitudinal stripe, laterad with off-white area reaching to dark brown notaulus; lateral lobe of mesoscutum with off-white triangular area between posterolateral notaulus and posterolateral brown patch; inner corner of axilla off-white, laterally dark brown; scutellum white with dark brown longitudinal stripe reaching to anterior edge of frenum, lateral panel of axilla dark brown; metanotum brown except dorsellum off-white; propodeum dark brown; wing veins dark brown. *Head*: Distinctly wider than high (5:4); upper face not swollen; in dorsal view with facial setae longer than greatest midocellus diameter and reaching (or nearly) inner eye margin (i.e., upper face without wide, bare area between setae and inner eye margin) (as in Fig. 23); face (Fig. 26) with carinae radiating from lower margin (excluding clypeus) to venter of toruli; genal area, postgenal area, and scrobal depression smooth; scrobal depression narrower than upper face (i.e., distance from lateral margin of depression to eye); scrobe carinate laterally, extending to dorsum of midocellus (i.e., midocellus in scrobal depression); malar sulcus complete but obscure ventrally; intermalar distance 2.3× malar distance; toruli higher than wide, venter about 1.5× own diameter above ventral eye margin, separated from each other by about ½ longest torulus diameter, interantennal area a raised lamelliform carina that continues within an ocellus diameter of venter of midocellus (Fig. 26); scape 0.9× eye height, laterally compressed; ratio of scape : pedicel : anellus : F1 : F2 about 16:3.5:1:9:9 (Fig. 41); anellus wider than long; F1–2 as wide as pedicel, F1–6 each about 5× as long as wide, F7 about 4× as long as wide, covered with appressed, dense, bristles (Fig. 38♀), some longer than width of segment; clava 0.5× length of F6+7; ratio of ocellocular : postocellar : mid-to-lateral ocellus distance : lateral ocellus diameter about 1:1:0.3:0.7; lateral ocelli with carinae nearly reaching their posterolateral margin (Fig. 26). *Mesosoma*: Pronotum polished dorsally with faint transverse carinae, laterally smooth, in dorsal view slightly wider than long, in lateral view, slightly longer than high; mid- and lateral lobes of mesoscutum with faint transverse carinae (similar to pronotum); notaulus outlined laterally by indistinct carinae, with transverse carinae delimiting deep pits, with meeting transscutal articulation at point outside (laterad) scutoscutellar suture; parapsidal line absent; apical margin of scutellum not contiguous with transscutal articulation, separated by 2 round submedian pits each with indistinct pit laterad (Fig. 11); scutellum flat, smooth, with vague longitudinal carinae anteriorly; frenal line weakly present medially but obvious at lateral margins, ratio scutellum length : frenum length 2.5:1; scutellum posteriorly with narrow lamella and groove with pits (Fig. 11); propodeum strongly irregularly alveolate, most pronounced at margins (Fig. 33); spiracle about 0.5× own length from apical edge of propodeum, about 1.8× own length from metapleuron, about 0.25 median length of propodeum; postspiracular sulcus deep and traversed by 3 or 4 strong carinae forming deep pits; callus subequal in width to postspiracular sulcus, with effaced transverse carinae and long, widespaced setae; dorsellum convex, smooth, not projecting; nucha [not visible in female, see male description below]; mesepisternum smooth, delimited dorsally by strongly carinate ventral margin of femoral depression; femoral depression deep, well defined, with longitudinal carinae; transepimeral sulcus strongly developed from middle of epimeron to ven-

ter, entire epimeron longitudinally carinate; metapleuron with longitudinal carinae about as well developed as on epimeron, posterior margin (abutting propodeum) deeply depressed with several longitudinal carinae creating deep pits; dorsal length of metabasitarsus (shortest length) about ⅔× length of tarsomeres 2–5; tarsal claws simple (as in Fig. 43); both metatibial spurs curved, longer spur about 2× length of shorter spur; forewing ratio of submarginal vein : basal vein : marginal vein : postmarginal vein as 6:3:1.3:4; costal cell without setae dorsally, ventrally with 1 row along anterior margin, 2 or 3 rows in distal ½; basal cell with 1 or 2 setae on dorsal surface, cubital vein basally with row of setae on underside (only); forewing surface beyond basal vein almost completely covered with setae except small bare area proximal to parastigma; petiolate segment of stigmal vein subequal to stigmal height, stigma nearly 2× as high as wide (Fig. 13♀), surrounded by narrow translucent brown band, ventral margin convex, uncus 2× as long as wide. *Metasoma*: Laterally compressed; ratio of mesosoma : metasoma : hypopygium about 5.5:5.5:6.

Male.—Body length 5.4–7.2 mm. Similar to female except corresponding brown areas broader (Fig. 8); dorsum of metasoma brownish. Ratio of scape : pedicel : anellus : F1 : F2 as 5:1:0.3:4:4, F1–7 each cylindrical, about 6 to 7× as long as wide, with 3 to 4 whorls of outstanding setae as long or nearly as long as segment; clava barely wider than funicle, subequal in length to F6+7, covered with short appressed setae (Fig. 38♂); pronotum with transverse carinae obvious; costal cell with numerous rows of setae along anterior margin of ventral surface, in addition to many setae in distal half; petiolate section of stigmal vein (Fig. 13♂) 0.66× as long as stigmal height, stigma as high as wide, roundish, surrounded by brown stain extending posteriorly half as far as stigmal height; uncus 2× as long as wide; propodeal nucha a narrow band, indicated laterally, indistinct medially; metasoma ventrolaterally compressed.

Types.—Holotype ♀ with following data: "Malaysia, (San Fran[cisco] POE [Port of Entry]), June 10, 1970, Sd [seed] *Pandanus aurantiacus*, Patterson" (deposited in USNM); 2 ♂ paratypes, same data (USNM).

Etymology.—The name is derived from the Latin "*orba*" meaning "orphan" in reference to the unknown precise geographic origin of this species.

Distribution.—The original area of collection was given only as "Malaysia."

Host.—The type specimens were reared from seeds of *Pandanus aurantiacus* Ridl.

Discussion.—Males of this species are phenetically similar to the male paralectotype of *pilicornis* in size, coloration, the midocellus within carinate scrobal depression, the lamelliform interantennal carina, the face carinate from the clypeus to the lower margin of the lateral ocelli, and in not having the upper face swollen. Although only the metasoma of female *pilicornis* is known, it is likely that most of the characters cited below will work for females as well. The stigmal shape may be an exception because it is generally dimorphic in *Bootania* (and megastigmines in general). The following characters may be used to separate males: *orba* has the pronotum evenly transversely carinate (*pilicornis* is essentially smooth with a few faint carinae apically); *orba* has a distinct frenal line laterally, apically the scutellum is longitudinally carinate, and posteriorly the apical lamella is evenly pitted (Fig. 11) (in *pilicornis* there is no sign of a frenal line and apically the scutellum is completely smooth, Fig. 12); *orba* has the stigma (Fig. 13♂) wider than high, surrounded by a brown stain, and the stigmal vein arises from the marginal at an angle (*pilicornis* has the stigma higher than wide, no surrounding brown stain, and the stigmal vein is nearly perpendicular to the marginal, Fig. 18); and in *orba* the lateral ocelli

have carinae nearly reaching their posterolateral margin (Fig. 26) (in *pilicornis* the area is slightly depressed and nearly smooth). The only known male of *pilicornis* is missing its antennae, so we cannot compare this feature with *orba*.

Specimens of this species were reared from *Pandanus* fruits imported from Malaysia that were intercepted at the San Francisco Port of Entry. No more specific, data are available.

8. *Bootania pilicornis* (Cameron)
Figs. 4, 12, 18

Eutanycornus pilicornis Cameron 1909:210. Lectotype ♀ [designated by Bouček 1988:127], Kuching, Sarawak, Borneo (BMNH, examined; all that remains is the abdomen with ovipositor pinned to a point by minutin); 1 ♂ ?paralectotype [designated by Bouček 1988:127], Quop, Sarawak (BMNH, on minutin, examined).

Bootania pilicornis: Transferred by Bouček 1988: 127.

Female lectotype. [Because only the metasoma remains of the lectotype, the description that follows cites salient details from Cameron (1909) in quotes with the articles removed; we have seen no additional females of this species.]—Body length "5 mm; ovipositor, 8 mm." *Color*: "Black, smooth, and shining, sparsely covered with longish black hair, . . . antennal scape and legs rufo-testaceous, . . . mandibles and oral region of a slightly darker rufo-testaceous colour, . . . wings hyaline, nervures blackish, . . . stigmal spot longish oval." *Head*: Antennae with "third joint [F-1] distinctly longer than . . . fourth [F2];" "flagellum densely pilose;" "transverse furrow at . . . base of . . . scutellum, from either side of which a shorter oblique one runs along the sides." *Mesosoma*: "Metanotum [?mistake for mesonotum], except the outer edges [?side lobes], transversely rugose;" "metapleurae [metapleuron] smooth above, . . . lower part striated at . . . base, . . . rest coarsely aciculated, . . . middle [?femoral depression] broadley depressed. *Metasoma* (from specimen): Length of gaster 2 mm; laterally compressed, reddish brown, ventral half with pale, whitish yellow stripes on last 4 or 5 terga fading into same color completely ventrally.

Male paralectotype. [This specimen is described in detail because the only known female lacks all head and mesosomal characters. The paralectotype male is missing its funiculars, and the data concerning these is cited from Cameron (1909) in quotes.]—Body length 6 mm. *Color* (Fig. 4): Almost entirely yellow (to whitish yellow) except brown are: transverse band on face beginning behind ocelli and extending midway down scrobe; dorsum of pronotum except submedian narrow yellow stripes extending from posterior margin anteriorly ⅔ way to anterior margin; outer margin of side lobe, median band extending from anterior of mid lobe to frenal line; median and lateral areas of propodeum; dorsum of metasoma (except submedian yellow spot on metasomal tergum 2). *Head*: Wider than high (5:4); upper face not swollen; in dorsal view with facial setae longer than greatest midocellus diameter and reaching (or nearly) inner eye margin (i.e., upper face without wide, bare area between setae and inner eye margin) (as in Fig. 23); face with carinae extending from lower margin (excluding clypeus) to venter of lateral ocelli; genal area, postgenal area, and scrobal depression smooth; scrobal depression narrower than upper face (i.e., distance from lateral margin of depression to eye); scrobe carinate laterally, extending to dorsum of midocellus (i.e., midocellus in scrobal depression); malar sulcus present but barely indiscernible ventrally; intermalar distance about 2.5× malar distance; toruli higher than wide, venter about own short diameter above ventral eye margin, separated from each other by about ½ shortest torulus diameter, interantennal area a raised lamelliform carina that continues to within ocellus diameter of venter of midocellus;

scape about 0.9× eye height, laterally compressed; "joints of flagellum [F1–7] fringed with longish stiff hair;" "[club] thicker than others, closely shortly pilose"; ratio of ocellocular : postocellar : mid-to-lateral ocellus distance : lateral ocellus diameter about 1.4:1:0.3:0.7; area between lateral ocelli depressed, inner margins of ocelli raised above area, distinct circular depressed area on outer margin, about long diameter of ocellus. *Mesosoma*: Flattened, pronotum and propodeum nearly in same plane; pronotum dorsally mostly smooth, polished, with transverse carinae in anterior $\frac{1}{5}$ and several carinae in posterior $\frac{1}{3}$, laterally smooth, in dorsal view slightly longer than wide, in lateral view, 0.6× as long as high; mesoscutum with obvious transverse carinae [minutin obscures most of area], though somewhat obscure on lateral areas of lateral lobes, remainder of mesosoma dorsally polished except along outer edge of notaulus (i.e., inner margin of lateral lobe); notaulus outlined laterally by indistinct carinae, with transverse carinae delimiting deep pits; notaulus meeting transscutal articulation at point outside (laterad) scutoscutellar suture; parapsidal line absent; apical margin of scutellum not contiguous with transscutal articulation, separated by ill-defined pitlike depressions (Fig. 12); scutellum smooth, flat; frenal line absent, posteriorly with flat, projecting lamella not delimited by groove (some obscure carinae may be seen perpendicular to lamella) (Fig. 12); propodeum covered with irregular carinae, some forming pits, obscure median triangle indicated by diagonal carinae branching from anterior edge, in dorsal view median area appearing elevated and separated from postspiracular groove by carina; spiracle in dorsal view about 0.7× own greatest length from apical edge of propodeum, about 1.3× own length from metapleuron, about 0.2× median length of propodeum; postspiracular sulcus deep and traversed by 2 strong carinae forming 3 deep pits; callus subequal in width to postspiracular sulcus, with effaced transverse carinae and long, widespaced setae; dorsellum convex, smooth, not projecting; nucha a wide band with transverse carinae; mesepisternum smooth to weakly reticulate; femoral depression deep, transversely crossed with distinct carinae, transepimeral sulcus a deep pit dorsally, continuing as shallow, pitted groove to mesepisternum; posterior half of mesepimeron strongly carinate; metapleuron medially smooth, with well developed longitudinal carinae around margin; dorsal length (shortest) of metabasitarsus about ½ length of tarsomeres 2–5; inner metatibial spur straight, about 2× as long as outer spur; tarsal claws simple (as in Fig. 43); forewing ratio of submarginal vein : basal vein, marginal vein : postmarginal vein as about 6:1.2:1.5:3.6; costal cell dorsally with several setae on apical anterior edge, ventrally entirely setose; basal cell with several setae on ventral surface and 1 dorsally, cubital vein asetose; stigmal vein almost perpendicular to marginal vein, petiolate segment of stigmal vein 0.3× stigmal height, stigma height 1.2× width (Fig. 18), ventral margin convex, uncus longer than wide. *Metasoma*: Dorsoventrally compressed.

Material examined.—Only the lectotype female (metasoma) and paralectotype male have been seen.

Distribution.—This species is known only from Malaysia (Sarawak).

Discussion.—Cameron (1909) based generic characters for his new genus *Eutanycormus* primarily on the male, emphasizing both the "densely pilose antennae" and the oblique vein issuing from the submarginal (i.e., the prominent basal vein). He based the species description of *pilicornis*, the only included species, entirely on the female. Bouček (1988:127) discussed the problems involved with selecting a lectotype for this species. He chose the female, which consisted of only the metasoma. It was not clear if the male should be considered a paralectotype of *pilicornis*,

and to confuse the matter even more, the specimen is labeled "Eutanycormus longicollis Cam", which according to Bouček (1988) is a manuscript name. There is not even certainty that the two sexes are correctly associated. Cameron (1909) stated that the female was black, yet the male is mostly yellow.

In the lectotype female, the ovipositor is greater than 3× the length of the metasoma (100:30), but it is obviously broken off. According to the original description the ovipositor was 8 mm; the metasoma is 2 mm by current measurement, and so the length of the ovipositor should be about 4× that of the metasoma. The metasoma has 5 indistinct yellow spots laterally, and this may be the primary basis for recognizing the female of this species at the present time.

The single known male of *pilicornis* most closely resembles males of *orba*, and the two are compared extensively under the latter species.

9. *Bootania ruficeps* (Cameron)
Figs. 22, 32, 46

Spilomegastigmus ruficeps Cameron 1905:74. Lectotype ♀ (designated by Bouček 1988:127), "Kandy, Ceylon" (BMNH, examined). [Missing both antennae beyond pedicel; left hind leg including coxa; abdomen detached, glued to same card.]

Bootania ruficeps: Transferred by Bouček 1988: 127.

Female lectotype.—Body length 7 mm; ovipositor 17 mm. *Color*: Body reddish orange, except following areas yellow (not well differentiated from body color): apical two-thirds of midlobe of scutum, shoulder of side lobes, axillae, clypeus, malar area, dorsellum, all legs including coxae, five circular spots on sides of metasoma (sixth area may be seen, but weakly developed); dark mahogany brown are forewing veins, stain around stigma, most of metasoma. *Head*: Wider than high (11: 9); upper face not swollen; in dorsal view with facial setae longer than greatest midocellus diameter and reaching (or nearly) inner eye margin (i.e., upper face without wide, bare area between setae and inner eye margin) (as in Fig. 23); face with distinct carinae radiating from malar area around clypeus to venter of lateral ocellus; scrobal depression narrower than upper face (i.e., distance from lateral margin of depression to eye); scrobe carinate laterally, disappearing halfway to midocellus (i.e., midocellus not in scrobal depression); malar sulcus present; intermalar distance about 2.5× malar distance; toruli slightly higher than wide, venter about 3× own long diameter above venter of eyes, separated from each other by ½ torulus diameter, carina present between toruli extending less than ½ torulus diameter upward; scape cylindrical, not reaching vertex; ratio scape to pedicel *ca* 4:1 (remainder of both antennae missing); ratio of ocellocular : postocellar : mid-to-lateral ocellus distance : lateral ocellus diameter as 21:21:9: 11. *Mesosoma*: Pronotum smooth, with fine transverse, carinae seen only at some angles of view, in dorsal view wider than long (4:3), in lateral view longer than high (5:4); mid- and lateral lobes of mesoscutum with distinct transverse ridges, in anterior half these ridges curve forward medially; notaulus deeply grooved, meeting transscutal articulation at same point as scutoscutellar suture; parapsidal line absent; apical edge of scutellum flush with transscutal articulation, appearing broadly contiguous; scutellum highly polished with few weak transverse carinae apically; ratio of scutellum length : frenum length 3: 1; frenum not physically indicated (i.e., no sulcus), but indicated by line under integument that lacks pigment, thus apparent frenal line; scutellum posteriorly with narrow lamella rimmed by obscure pits; propodeum (Fig. 32) dorsally with single median carina branching posteriorly as submedian carinae which circle around and meet nucha at sides, these carinae delimit essentially flat, polished median area; four carinae (on each side) branch off subme-

dian carina onto lateral areas of propodeum; spiracle about ½ half its own greatest length from apical edge of propodeum, about 1.5× own length from metanotum, about ¼ median length of propodeum; postspiracular sulcus indicated by 3 or 4 distinct pits, propodeum with broad lamella at each posterolateral corner; metanotum mostly obscured by glue, dorsellum convex, smooth, unmodified; nucha lamelliform (i.e., not evident as parallel-sided, raised band); femoral depression and side of mesosoma obscured by glue; inner hindtibial spur straight, about 1.7× length of outer spur; metatarsal claw simple with subapical dorsal seta; forewing (Fig. 46) ratio of submarginal vein : basal vein : marginal vein : postmarginal vein as 11:2:5:8; costal cell without setae dorsally, ventrally with 1 or 2 rows along anterior margin, distal area with 3 or 4 rows, basal cell with a few setae medially, cubital vein asetose; petiolate segment of stigma about 2× stigmal height, stigma height 1.5× width (Fig. 22), ventral margin convex, uncus longer than wide. *Metasoma*: Laterally compressed, ratio of mesosoma : metasoma : hypopygium as 7:9:9.

Male.—Unknown.

Material examined.—We have seen only the lectotype female of this species.

Distribution.—Sri Lanka.

Discussion.—Narendran (1994) redescribed the lectotype female. In the lectotype, the presence of a frenal area appears to be indicated by a transparent line, but it has no physical groove; additional specimens are required to determine the status of this character.

Bootania ruficeps appears distinct based on the nearly smooth, flattened median area of the propodeum (Fig. 32), a character found only in *B. titanus* (though somewhat reticulate rather than smooth). The nucha of *ruficeps* is indistinct (Fig. 32; distinct in *titanus*, as in Fig. 36) and in *ruficeps* the stigma has an elongated stigmal stain (Figs. 22, 46; not elongated in *titanus*, Fig. 45) with the remainder of the forewing hyaline (Fig. 46; some vein tracts stained in *titanus*, Fig. 45).

10. *Bootania solomonensis* (Milliron) Figs. 15, 23

Pulvilligera solomonensis Milliron 1950:352–354 (Figs. 6–7). Holotype ♀, 6 mi. from mouth of Tenaru River, Guadalcanal, Solomon Islands, 13 August 1941, H. E. Milliron, ex seed of *Pandanus* (USNM, examined); 44 ♀, 25 ♂ paratypes same data as holotype (USNM, 44 ♀, 21 ♂ examined; 4 ♂ specimens missing).

Bootania solomonensis: Transferred by Bouček 1988:128.

Female paratypes.—Body length (excluding ovipositor) about 6 to 9 mm; ovipositor length about 10 to 17 mm. *Color*: Yellowish brown with following areas reddish brown: median longitudinal stripe on pronotum, posterior half of scutum, and scutellum anterior to frenum; anterodorsal region of first metasomal tergite; stripe connecting posterior ocelli to anterior ocellus; eyes; dark brown areas are: dorsal surface of scape and pedicel; flagellum; ovipositor sheaths; wing veins. *Head*: Barely wider than high; upper face not swollen; in dorsal view with facial setae longer than greatest midocellus diameter and reaching (or nearly) inner eye margin (i.e., upper face without wide, bare area between setae and inner eye margin) (Fig. 23); face with minute longitudinal carinae radiating from lower margin (excluding clypeus) to venter of ocelli; genal area, postgenal area, and scrobal depression smooth; scrobal depression narrower than upper face (i.e., distance from lateral margin of depression to eye); scrobe carinate laterally, extending to ½ ocellar diameter below venter of midocellus (i.e., midocellus not in scrobal depression); malar sulcus complete; intermalar distance about 2.75× malar distance; toruli as high as wide, venter about 2.8× own diameter above ventral eye margin, separated from each other by slightly less than 1 torulus diameter, interantennal area a rounded lamelliform carina which terminates 1 to-

rulus diameter dorsal to toruli; scape about 0.7× eye height, laterally compressed; ratio of scape : pedicel : anellus : F1 : F2 about 3.5:1:0.2:2.1:2.1; anellus wider than long; F1–2 scarcely wider than pedicel, F1–5 each about 4× as long as wide, F6 about 3× as long as wide, F7 about 2× as long as wide, covered with appressed, dense bristles, each shorter than width of segment; clava about 0.8× length of F6+7; ratio of ocellocular : postocellar : mid-to-lateral ocellus distance : lateral ocellus diameter about 1:1:0.4:0.5. *Mesosoma*: Pronotum dorsally with faint transverse carinae, laterally smooth, in dorsal view barely longer than wide, in lateral view, slightly longer than high; lateral and posterior ⅔ of midlobe of mesoscutum with faint transverse carinae (similar to pronotum); nettles deeply grooved, meeting transscutal articulation at point outside (laterad) scutoscutellar suture, nettles with transverse carinae delimiting deep pits, separated by 4 rounded submedial pits; parapsidal line absent; apical margin of scutellum widely contiguous with transscutal articulation, separated by shallow groove with longitudinal carina delimiting pits; scutellum smooth, flat; frenal line weakly present medially but indiscernible laterally; ratio of scutellum length : frenum length 2.2:1; scutellum posteriorly with marginal rim lamelliform and groove with ill defined pits; propodeum regularly carinate; spiracle about 0.6× own length from apical margin of propodeum, about 1.5× own length from metapleuron, about 0.25× median length of propodeum; postspiracular sulcus deep and traversed by 2 or 3 strong carinae forming deep pits; callus slightly wider than postspiracular sulcus, with effaced transverse carinae and long, widespaced setae; dorsellum convex, smooth, not projecting; nucha a faint, narrow band indistinct medially but discernible laterally; mesepisternum smooth, delimited dorsally by strongly carinate ventral margin of femoral depression; femoral depression moderately shallow, well defined, with transverse carinae; transepimeral sulcus weakly developed from middle of epimeron to venter, epimeron longitudinally carinate anteriorly to transversely carinate posteriorly; metapleuron with weak longitudinal carinae, posterior margin (abutting propodeum) deeply depressed with several longitudinal carinae creating deep pits; dorsal length (shortest) of metabasitarsus about 0.7× length of tarsomeres 2–5; tarsal claws simple; inner metatibial spur slightly curved, about 3× as long as outer spur; forewing ratio of submarginal vein : basal vein : marginal vein : postmarginal vein about 4.1:1:1.6:3; costal cell without setae dorsally, ventrally with 4 to 5 rows of setae at distal ¾, more tightly spaced anteriorly than ventrally; basal cell with several setae on dorsal surface adjacent to posterior ½ of basal vein, cubital vein basally without setae; petiolate segment of stigmal vein about 0.7× stigmal height, stigma about 1.5× as high as wide (Fig. 15♀), surrounded by narrow translucent brown band, ventral margin convex, uncus about 2× as long as wide. *Metasoma*: Laterally compressed; ratio of mesosoma : metasoma : hypopygium about 1:1.2:1.1.

Male.—Body length 7 to 8 mm. Similar to female except corresponding brown areas broader; dorsum of metasoma dark brown. Ratio of scape : pedicel : anellus : F1 : F2 as 5:1:0.2:3.5:4, F1–7 each cylindrical, about 8 to 10× as long as wide, with 3 to 5 whorls of outstanding setae about 0.7× length of segment; clava barely wider than funicle. about 0.8× length of F6+7, covered with short appressed setae; pronotum with transverse carinae obvious; costal cell with numerous rows of setae along anterior margin of ventral surface, in addition to many setae in distal half; petiolate section of stigmal vein (Fig. 15♂) about 0.2× as long as stigmal height, stigma about 0.7× as high as wide, roundish, surrounded by brown stain extending posteriorly about 0.25× as far as stigmal height; uncus about 3× as long as wide;

propodeal nucha a very narrow but distinct band; metasoma ventrally compressed.

Material examined.—We have seen no specimens other than the types. A large part of the type series (65 of 69 specimens) is in the USNM collection.

Distribution.—Specimens are known only from the Solomon Islands (Guadalcanal).

Host.—The types were reared from *Pandanus* seed.

Discussion.—*Bootania solomonensis* is distinguished by the combination of an undifferentiated median area on the propodeum, the undeveloped interantennal area (as in Fig. 27), the simple tarsal claws (as in Fig. 43), the setose stigmal area (Fig. 15), and the head without a swollen upper face (Fig. 23).

11. *Bootania titanus* (Girault)
Figs. 5, 45

Epimegastigmus titanus Girault 1938:147–148. Holotype ♀, "south-east Papua" (QM, examined). [Badly fragmented: thorax on point with right forewing, right foreleg, (missing tarsomere 5), left forecoxa, left leg (missing all tarsi); glued on label are: head (broken and face down in glue), pieces of antenna (as noted below), one midleg, a femur, metasoma (ovipositor sheaths separate).]

Megastigmus titanus: Transferred by Milliron 1949:353.

Bootania titanus: Transferred by Bouček 1988: 128.

Female holotype.—Mesosoma + metasoma about 10 mm (head broken); ovipositor length about 21 mm. *Color* (Fig. 5): Brownish to black with following areas yellow: postgenal area extending from malar area to dorsum of head, dorsally curving onto occipital area almost to foramen; pronotum dorsally with two submedian spots, laterally with ventral spot extending half way to dorsum; lateral lobe of mesoscutum with submedian longitudinal bands from apex to posterior margins; scutellum (except median longitudinal brown strip) and inner portions of axillae; metanotum; callus of propodeum; metapleuron; outer surface of coxae; terga 2, 4, and 6; wing veins dark brown, stigma surrounded by narrow brown stain, brown stain extending along entire vein tracks of cubital and medial setal lines (about ⅕ apex of wing missing). *Head* (only posterior half visible; antennae in pieces): Area surrounding ocelli with fine transverse carinae; ratio of anellus : F1 : F2 as 1:10:10; F1, F2 as wide as pedicel, anellus as long as wide; funicular segments with semi-erect, dense, bristles, each about equal to width of funicle; F1–5 about 5× longer than wide; ratio of ocellocular : postocellar : mid-to-lateral ocellus distance : lateral ocellus diameter as 14:10:5:6. *Mesosoma*: Pronotum dorsally with fine, transverse carinae, laterally smooth, in dorsal view longer than wide; in lateral view, slightly longer than high; mid- and lateral lobes of mesoscutum with fine, transverse carinae (similar to pronotum); notaulus deeply grooved, meeting transscutal articulation at point outside (laterad) scutoscutellar suture, notaulus with transverse carinae delimiting shallow pits; parapsidal line absent; apical margin of scutellum narrowly contiguous (not meeting at a single point); scutellum smooth, flat, frenal line absent; apical half with median, longitudinal depression; posteroapically with wide lamella with distinct longitudinal carinae delimiting pits; propodeum medially reticulate surrounded by symmetrical submedian carinae from which radiate somewhat irregular carinae; spiracle about ⅓ own greatest length from apical edge of propodeum, 1.5× own length from metapleuron, about ¼ median length of propodeum; neither postspiracular sulcus nor callus well defined, area deeply depressed to metapleuron, at least 1 strong posterolateral carina forming deep depression; dorsellum convex, smooth, not projecting; area corresponding to callus without setae; nucha a distinct raised collar; femoral depression

with well-delimited carinae forming pits; transepimeral sulcus distinct, divided into pits by transverse carinae; mesepimeron and metapleuron with transverse carinae; [data on inner metatibial spur not recorded], foreleg and midleg each with simple tarsal claw (as in Fig. 43); forewing (Fig. 45) ratio of submarginal vein : basal vein, marginal vein : postmarginal vein as 8:1.5:2:4; costal cell without setae dorsally, ventrally with several rows of setae at distal ⅓; basal cell asetose; cubital vein without setae; petiolate segment of stigmal vein 0.7× stigmal height, stigma height about 0.9× width, ventral margin straight, uncus longer than wide. *Metasoma*: Laterally compressed; ratio of mesosoma : metasoma : hypopygium about 1:1:1.2 (hypopygium exceeds metasomal apex, but this may be artifact of drying).

Male.—Unknown.

Material examined.—We have seen only the holotype female from Papua.

Distribution.—Known so far only from Papua New Guinea.

Discussion.—The only known specimen is the female type. *Bootania titanus* is morphologically similar to *ruficeps* (also known only from the female) based largely on the medially encircled area of the propodeum (as in Fig. 32). The species differ primarily in the wing in which *titanus* has the stigma evenly surrounded by a narrow brown stain (Fig. 45; *ruficeps* with a posteriorly elongated stain, Fig. 46) and the cubital and medial vein tracks are stained brown (Fig. 45; *ruficeps* with wing vein tracks hyaline, Fig. 46).

12. *Bootania xestos* Grissell and Desjardins, new species

Figs. 21, 25, 31, 39

Female holotype.—Body length (excluding ovipositor) 6.7 mm (ovipositor length not measurable because it is hair-like and curled). *Color*: Black except the following yellow: face below midpoint of eyes, sides of pronotum, ventral area beneath pronotum, fore-and midlegs (including coxae), hindleg (excluding coxa), wing veins dark brown. *Head*: Distinctly wider than high (3:2); upper face barely swollen; in dorsal view with facial setae longer than greatest midocellus diameter and reaching (or nearly) inner eye margin (i.e., upper face without wide, bare area between setae and inner eye margin) (Fig. 25); face with faint carinae from dorsal edge of clypeus to midpoint of eyes, absent between upper margin of clypeus and venter of toruli; weak carinae present across band of ocelli and hind margin of head (anterior to occipital carina); scrobal depression (Fig. 25) wider than upper face (i.e., distance from lateral margin of depression to eye), with weak lateral carina extending nearly to venter of midocellus (i.e., midocellus not in scrobal depression); malar sulcus complete; intermalar distance about 2.5× malar distance; toruli as high as wide, venter about 1.3× own diameter above ventral eye margin, separated from each other by about 1 torulus diameter; interantennal area with slightly lamelliform carina reaching barely ¾ distance to midocellus; scape subequal to eye height, ventrally flat, dorsally rounded, tapered from base to apex; ratio of scape : pedicel : anellus : F1 : F2 as 14:3.5:1:7:7; anellus nearly as wide as long; F1–2 as wide as pedicel, F1 4× as long as wide, each segment becoming shorter to F7 about 2× as long as wide, covered with erect bristles all longer than width of segment; clava subequal to length of F6+7; ratio of ocellocular : postocellar : mid-to-lateral ocellus distance : lateral ocellus diameter about 3:3:1:2. *Mesosoma*: Flattened pronotum and propodeum nearly in same plane; pronotum polished dorsally with faint transverse wrinkles anteriorly, laterally smooth, in dorsal view slightly wider than long, in lateral view, slightly longer than high; mid- and lateral lobes of mesoscutum polished, no carinae; notaulus widening gradually from anterior to posterior with transverse carinae delimiting

distinct pits, meeting transscutal articulation at point outside (laterad) scutoscutellar suture; parapsidal line absent (obscure depression may be seen at some angles of view); apical margin of scutellum contiguous with transscutal articulation; scutellum flat, smooth; frenal line absent; scutellum posteriorly with wide lamella and groove with ill-defined pits; scutellum, metanotum, and propodeum in same plane; propodeum with pattern of carinae as shown in Fig. 31; areas between carinae flat, shagreened; in dorsal view median area appearing elevated and separated from postspiracular grove by carina; spiracle (Fig. 31, inset) set within chamber formed by upward projecting cuticular structure encircled by translucent rim (outwardly chamber, itself, appears to be much enlarged spiracle); actual spiracle (not chamber opening) about 0.75× own length from apical edge of propodeum, about 1.5× own length from metapleuron, about 0.25 median length of propodeum; postspiracular sulcus deep and traversed by several irregular carinae forming deep pits; callus subequal in width to postspiracular sulcus, nearly smooth and without widespaced setae; dorsellum flat, smooth; nucha poorly defined; mesepisternum smooth; femoral depression well defined, with longitudinal carinae; transepimeral sulcus weakly developed from middle of epimeron to venter; metapleuron essentially smooth, posterior margin (abutting propodeum) deeply depressed as sulcus of uniform width throughout; dorsal length of metabasitarsus (shortest length) about 0.9× length of tarsomeres 2–5; tarsal claws simple; both metatibial spurs straight, longer spur about 2× length of shorter spur; forewing ratio of submarginal vein : basal vein : marginal vein : postmarginal vein as 9:1.6:3:7; costal cell without setae dorsally, ventrally with 2 or 3 rows in distal ½; basal cell and cubital veins without setae; wing surface beyond basal vein almost completely covered with setae except small bare area proximal to parastigma; petiolate segment of stigmal vein about 0.66× stigmal height, stigma 1.5× as high as wide (Fig. 21), surrounded by narrow translucent brown band, ventral margin convex, uncus about 1.5× as long as wide. Metasoma: Laterally compressed; ratio of mesosoma : metasoma : hypopygium as 5:5:4.

Male.—Unknown.

Types.—Holotype ♀ with following data: Papua New Guinea, Madang Prov., Nokopo, Aug. 1987, 2000 m., D. Sands, ex fruit *Pandanus* (deposited in ANIC); 3 ♀ paratypes, same data as holotype (2 paratypes ANIC, 1 paratype USNM).

Etymology.—The name is derived from the Greek "*xestos*" meaning polished, in reference to the mesosoma of this species.

Distribution.—Known only from Papua New Guinea.

Host.—The type specimens were reared from seeds of *Pandanus*.

Discussion.—This species is unique among known *Bootania* based on the following character states: The coloration is entirely black in dorsal aspect (other species are essentially all yellow or patterned mixtures of black, orange, yellow, and/or white); the propodeal spiracle (Fig. 31, inset) is set within an elevated, chamberlike structure encircled by a translucent rim (other species have no such chamber or encircling rim, e.g., Fig. 33, inset); the propodeum (Fig. 31) has a flat, elevated median section with distinct, well-defined carinae separated by flat, shagreened spaces (other species, except *B. pilicornis*, have a poorly defined median section at best, with irregular carinae forming pits, as in Fig. 33), or in some cases a well-defined circular area (Fig. 32); the toruli (Fig. 25) are separated by a distance at least their own short diameter apart (other species have the distance distinctly less than a diameter—generally about half, as in Fig. 23, 26–28); the scrobal basin (Fig. 25) is wider than the upper face between the depression and the inner eye

margin (other species have this distance less than the scrobal depression, as in Fig. 23, 24, 26–28); and females have flagellomeres (Fig. 39) with erect setae that are longer than the width of the segment (other species usually have appressed setae that are shorter than the width of the segment, as in Fig. 40, 41), and the longitudinal sensilla of the flagellomeres are produced as curved, flattened projections (Fig. 39) (other species usually have longitudinal setae that are appressed to the flagellomere as in Figs. 40–42). With respect to the erect setae, females of *B. xestos* are somewhat like males of other known species.

Bootania xestos has three character states that are similar to ones found in *B. pilicornis*. In *B. xestos* the mesosoma is essentially smooth and polished with the exception of a few obscure transverse wrinkles on the pronotum (in *B. pilicornis* the mesosoma is smooth but with obscure wrinkles on the pronotum and weak carinae on the mesoscutum). In *B. xestos* and *B. pilicornis* the mesosoma is flattened so that the pronotum is nearly in the same plane as the propodeum. These are the only two species that are pronouncedly flattened. Finally in *B. xestos* and *B. pilicornis* the median area of the propodeum appears elevated and separated from the postspiracular groove by a carina, but the two differ, however, in the spiracle as stated above.

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